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JOURNAL OF
# Agriculture

FEBRUARY · 1950

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No. 9 PUBLISHED EVERY SECOND MONTH FEBRUARY, 1950

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## *This month's cover*

*Pickers harvesting sweet oranges in a citrus orchard at Kerikeri is the subject of this month's cover, which has been reproduced from a natural-colour photograph by National Publicity Studios. The Kerikeri district produces more than 60 per cent. of the sweet oranges grown commercially in New Zealand, estimated production for the 1948 season being 13,000 packed bushels. There were 215 acres devoted to the crop at Kerikeri in 1948. Total production of all citrus fruits from Kerikeri orchards in 1948 was about 42,000 packed bushels.*

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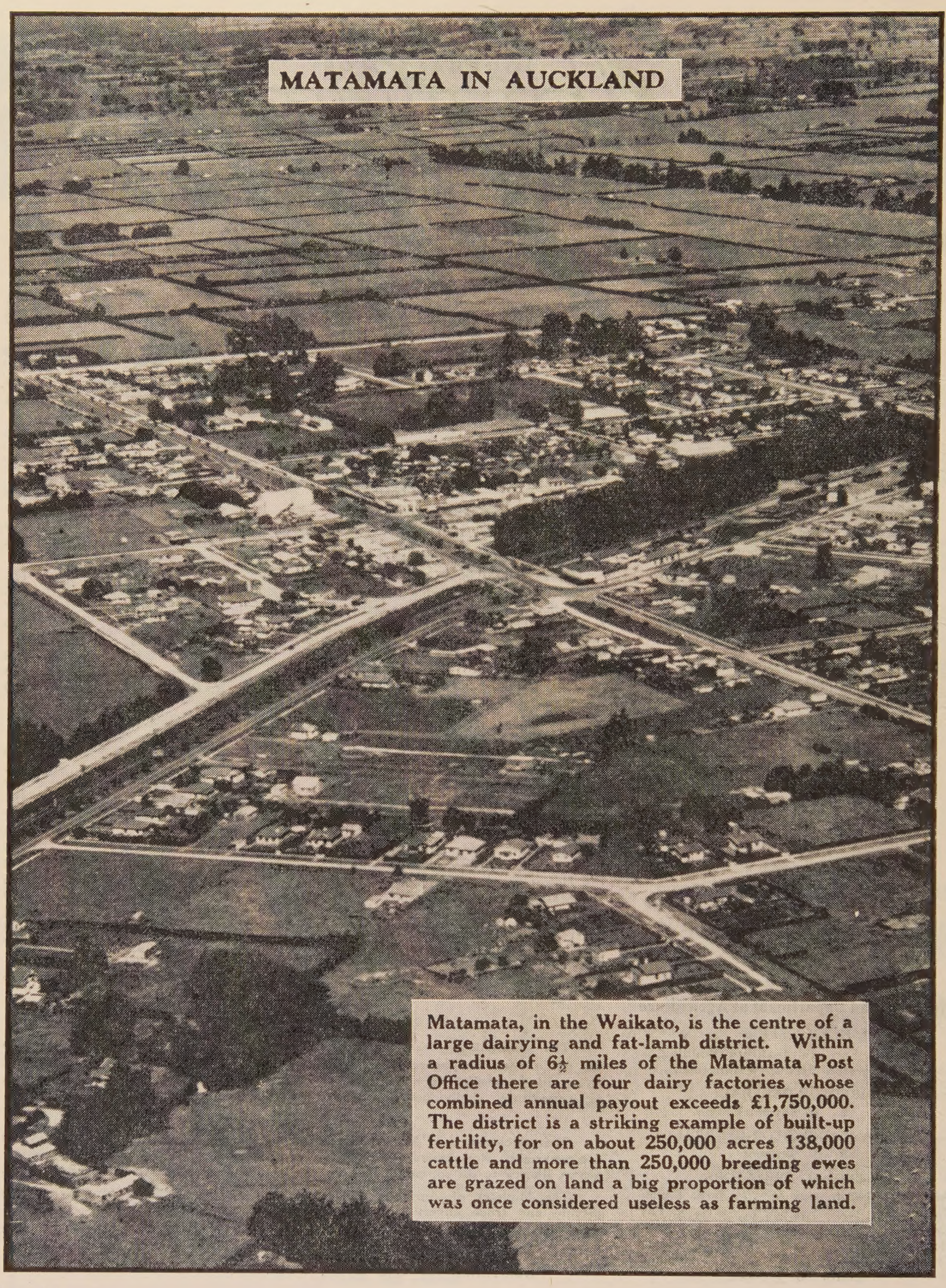


# MATAMATA IN AUCKLAND

Matamata, in the Waikato, is the centre of a large dairying and fat-lamb district. Within a radius of 6½ miles of the Matamata Post Office there are four dairy factories whose combined annual payout exceeds £1,750,000. The district is a striking example of built-up fertility, for on about 250,000 acres 138,000 cattle and more than 250,000 breeding ewes are grazed on land a big proportion of which was once considered useless as farming land.

[V. C. Browne photo.

# DAIRY INDUSTRY'S ACHIEVEMENTS

IT is a source of great satisfaction to me that in the first year in which I have assumed the portfolio of Minister of Agriculture there are prospects of a record season in dairy production. While the recent dry spell may have checked the upward trend, on the figures up to the end of December and with reasonably good conditions for the next month or so we may well look forward to the best production figures in the history of the industry.

Ever since the days when the introduction of refrigeration made possible the sale of New Zealand dairy products on the world's markets the dairy industry has held a key position in this Dominion's economy. Today there are 370 dairy factories, almost all of which are co-operatively owned, with 53,000 suppliers. The export value of dairy products in the 1948-49 season was about £50,000,000. That figure alone demonstrates the importance of the great enterprise, but in addition the industry provides New Zealanders with milk of good quality, butter, cheese, and other dairy products.

Nor are initiative and adaptability lacking in the industry: Recently there has been rapid development in the production of dried milk, exports of which have added significantly to our national income.

## Reputation for Quality Produce

A splendid response has been and is being made by dairy farmers and their helpers to increase the quantity of dairy products which we can make available to our kinsfolk in the United Kingdom and it should be gratifying to dairy farmers to know that they have placed New Zealand at the head of the countries supplying Britain with butter and cheese. What is equally gratifying to me, and what is of paramount importance to those in the industry and to the welfare of New Zealand as a whole, is that our reputation as regards the quality of our produce has never stood higher in Britain.

Despite shortages of labour and supplies and in face of difficulties caused by changed requirements from time to time, the high standards set for New Zealand dairy produce were adhered to during the war years. In those days, when quantity was often an important consideration where food supplies were concerned, there might, with justification, have been some relaxation of quality standards. But standards were maintained and as a result the reputation of our dairy produce on the British market today stands higher probably than even in the immediate pre-war years, when it was regarded as favourably as any imported product. This maintenance of quality standards has a most important bearing on the future of the dairy industry, as it means that on the score of good will our industry is soundly placed to meet what may again become a buyers' market. In view of the present world food situation the day of truly competitive markets may be some distance away, but it is heartening to know that dairy farmers and those connected with the manufacturing side of the industry are fully aware of the need for at least maintaining the already-high standard.

## Fullest Freedom to Manage Own Affairs

A feature of the organisation of the dairy industry in New Zealand compared with some other major dairying countries is that New Zealand farmers control the whole of their industry. In that they have the support of myself and my colleagues and our policy is to assist farmers to have the fullest freedom in managing their own affairs. The manner in which co-operatively-owned dairy companies have built up the quantity and quality of their products and have been prepared to exploit all the possibilities which seemed to offer hopes of bringing about better organisation within the industry shows conclusively that the dairy farmers have been well fitted to guide their own destinies.

In no country is a dairy industry better organised than it is in New Zealand and it is not the least of the achievements of the dairy farmers of this Dominion that collectively they have built an organisation which commands respect among acknowledged figures in the world of farming and economics.

## Work of Departmental Officers

Great as have been the efforts made by the farmers and their helpers I feel I must pay tribute also to the excellent work done by officers of my Department in assisting farmers with problems relating to both the production and manufacturing sides of dairy farming. Officers of my Department have always been loyally supported by farmers in the work they do and I know that officers of the Department will continue to tackle problems in the same energetic manner that has characterised their efforts to date.

I am fortunate in having as my Parliamentary Under-Secretary Mr. S. W. Smith, who has had a lifetime association with dairy farming. Mr. Smith will give special attention to dairy industry matters.

I have had first-hand experience of dairy farming and I appreciate fully the difficulties associated with this arduous but most-important occupation. I am looking to the full support of the industry in the matters affecting it which it will be my privilege to take up, and for my part will endeavour to advance the interests of the dairy farmers of this Dominion to the best of my ability.

K. J. HOLYOAKE, Minister of Agriculture.

# CARE OF LIVESTOCK DURING MARCH

Contributed by the Animal Research Division.

### CULLING OF EMPTY COWS

A COW should never be culled for sterility without being examined for pregnancy by a veterinary surgeon. Many cows thought to be empty have proved to be in calf when slaughtered at the works. The presence or absence of heat is not an infallible guide in diagnosing pregnancy. Good producers which are empty may be worth keeping, as about 80 per cent. of such cows hold when mated in the following season.

* * *

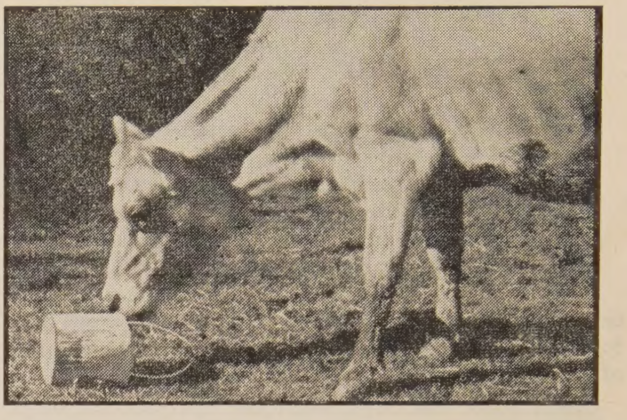
### PULPY KIDNEY VACCINATION OF EWES

If losses from pulpy kidney are usually experienced in lambs under 6 weeks old, they can be prevented only by vaccinating the ewes. If ewes have not been vaccinated in previous years, the first dose should be injected when they are crutched before tupping, and another dose should be injected just before lambing. Ewes which have been vaccinated in previous years require only the pre-lambing injection. Vaccination should be done in temporary yards. Syringes should be boiled before use and needles should be kept in methylated spirits and wiped and changed each time the syringe is filled. Vaccination of ewes will not be effective in preventing losses in lambs over 6 weeks old, and where such losses occur it is necessary to vaccinate the lambs themselves.

* * *

### DRYING OFF OF DAIRY COWS

To dry off a dairy cow simply stop milking her. This is quite safe and effective, but before drying off a cow examine the milk from each quarter in a strip cup, and if there is any sign of mastitis treat each affected quarter with 3 tubes of penicillin at 24-hour intervals, injecting the third tube after the last milking. If a quarter affected with mastitis feels lumpy, it is not likely to return to full production, and unless the cow is a very good producer she should be culled.



### LEAD POISONING IN CATTLE

Many cattle die from lead poisoning every year. As the commonest source of lead on the farm is paint, make sure that old paint tins are burnt or buried and do not allow cows or calves to lick surfaces from which paint is flaking.

* * *

### BLOWFLY STRIKE IN SHEEP

Blowfly strike in sheep is likely to occur in showery autumn weather when the humid conditions do not allow rapid drying of the fleece. Constant supervision is necessary to ensure that all cases are treated in the early stages. Shear the wool so as to leave a clean margin all round the strike and watch carefully for narrow tracks leading to areas some distance from the original strike. Treat with a good non-irritant dressing and be careful to collect and destroy the maggots, as if these are allowed to fall to the ground, they are capable of hatching into flies.

* * *

### FEED HAY TO CALVES

Calves should have access to good hay at all times. Hay is particularly valuable after the first autumn rains and will assist greatly in preventing the severe scouring which sometimes occurs after the grazing of lush, rapidly growing pasture. Make sure that the calves are rotated through the paddocks at intervals of a few days. Set stocking at this time of the year is bound to result in scouring, unthriftiness, and some deaths.

* * *

### SLEEPY SICKNESS IN EWES

Sleepy sickness in ewes, which in some seasons causes severe losses in pregnant ewes, is due to a sudden drop in the food supply just before lambing. On many farms the only feasible way to avoid this is by shutting up pasture in autumn for grazing by the ewes for 3 weeks before lambing. Short-rotation ryegrass is particularly valuable for this purpose, as it continues to grow during winter, even in Southland.

# THE DEVELOPMENT OF PEAT LAND

By F. B. THOMPSON, Agricultural Chemist,
Rukuhia Soil Research Station, Hamilton, and
I. L. ELLIOTT, Assistant Superintendent,
Rukuhia Soil Research Station, Hamilton.

**IN the Waikato district within 20 miles of Hamilton there are approximately 50,000 acres of waste land in peat swamps. Because these large undeveloped areas of "problem soils" were adjacent to main railways and roads and close to a large centre, experimental work on the development of peat swamps became one of the major projects of the Rukuhia Soil Research Station, Hamilton. This article describes how this research work has already thrown considerable light on the principles governing the turning of peat swamps into good pasture land.**

ACCORDING to geologists, the peat swamps in the Waikato originated thousands of years ago when gravel and sand deposited by the flooding of the ancestral Waikato River dammed back the local streams draining into the river. This ancestral river followed various courses (see the map on page 104) and blocked the local drainage in various localities in the Waikato basin. In the swamps thus created the waterlogged conditions excluded air and prevented the activities of the micro-organisms which bring about the normal decomposition of plant materials. Thus the partly decomposed vegetation accumulated and formed the present deposits of peat. The undrained, "raw" peat when dry consists of about 95 per cent. organic matter and 5 per cent. mineral matter or ash. By comparison dried pasture contains about 90 per cent. organic matter and 10 per cent. mineral matter, and normal soils contain about 5 per cent. and 95 per cent. respectively.

Removal of water by drainage permits air to enter the peat. As a result of the decomposition which then takes place part of the organic matter is destroyed. Thus as decomposition proceeds the percentage of organic matter in the peat slowly decreases and that of the mineral matter increases until a loamy soil is formed. In the classification and mapping of New Zealand soils the Soil Bureau of the Department of Scientific and Industrial Research, Wellington, has made the following classification of peats according to the percentage of organic matter they contain:—

Peat—more than 70 per cent. organic matter.

Loamy peat—between 50 per cent. and 70 per cent. organic matter.

Peaty loam—between 35 per cent. and 50 per cent. organic matter.

The various soil types are usually named after the localities where they frequently occur. Thus the name Rukuhia peat, or No. 110 on the soil maps, is applied to areas of acid peat wherever they occur. This type of peat occurs only in less-drained areas such as the central portions of the larger peat swamps. The more decomposed peat at the fringes of the big swamps in the Waikato is called Kaipaki peaty loam or loamy peat or number 108A on the maps. The location and acreages of the principal areas of these two soil types in the Waikato are shown in the map on the next page.

Although peat soils occur in almost all provinces of New Zealand, the only other extensive areas are in the Hauraki Plains and the Bay of Plenty. In the Hauraki Plains there are two large areas of Rukuhia peat totalling nearly 20,000 acres and fringed by 37,000 acres of Piako peaty loam and loamy peat (number 108 on the soil maps). As Piako peaty loam and loamy peat differ slightly from Kaipaki peaty loam and loamy peat, they are named differently.

## Methods of Developing Peat Land

In the development of peat for agricultural purposes drainage is the first essential. Because of its spongy nature and the fine particles it contains, peat, unless it is well decomposed, is practically impervious to water. Consequently, the movement of water through it is so slow that it is difficult to obtain good drainage without closely spaced subsidiary drains.

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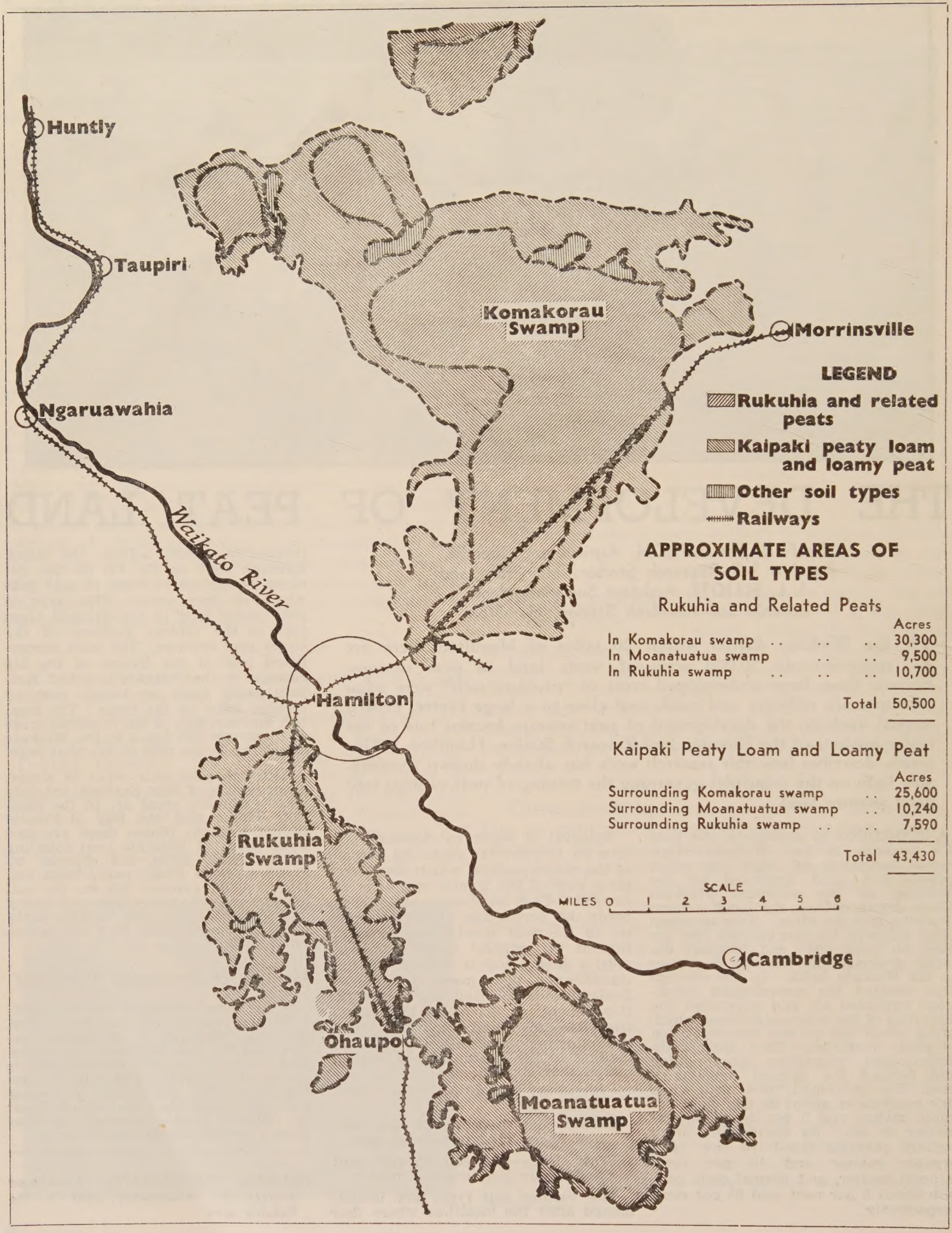
HEADING PHOTOGRAPH: **Established pasture on consolidated peat in the Rukuhia area.**

# PRINCIPAL PEAT AREAS IN THE HAMILTON BASIN


Huntly
Taupiri
Ngaruawahia
Komakorau Swamp
Morrinsville
Waikato River
Hamilton
Rukuhia Swamp
Ohaupo
Cambridge
Moanatuatua Swamp
LEGEND
▨ Rukuhia and related peats
▨ Kaipaki peaty loam and loamy peat
▥ Other soil types
Railways
SCALE
MILES 0 1 2 3 4 5 6

## APPROXIMATE AREAS OF SOIL TYPES

### Rukuhia and Related Peats

| | Acres |
|---|---|
| In Komakorau swamp .. .. .. | 30,300 |
| In Moanatuatua swamp .. .. | 9,500 |
| In Rukuhia swamp .. .. .. | 10,700 |
| Total | 50,500 |

### Kaipaki Peaty Loam and Loamy Peat

| | Acres |
|---|---|
| Surrounding Komakorau swamp .. | 25,600 |
| Surrounding Moanatuatua swamp .. | 10,240 |
| Surrounding Rukuhia swamp .. .. | 7,590 |
| Total | 43,430 |

In the Waikato the practice in general has been to deepen the main drains as rapidly as consolidation of the peat permitted until the drains were down into the underlying clay or sand. Over a period of years the peat dried out and was usually periodically burnt off as the water-table was lowered. A commonly held view is that the easiest way to develop shallow peat is to burn off the peat and to get down to the hard land as quickly as possible. This attitude was no doubt adopted because of the difficulties experienced in farming peat soils.

Peat is often too wet in winter and too dry in summer, and attempts to establish good pasture swards were disappointing. Although there was often a fair "take" from an autumn sowing after a burn, the better grasses usually disappeared after the first year and Yorkshire fog, browntop, and *Lotus major* were the main species which persisted. Frequently the sward of these species deteriorated after a few years and reverted to scrub and the land had to be disced, burnt, and resown. Normal topdressing practices such as the application of a few hundredweight per acre of a phosphatic fertiliser and some lime, which gave good results on the adjacent mineral soil in the Waikato, were often of little benefit on peat land.

There is little doubt that the policy of burning off the peat enabled extensive areas of former waste land to be developed into highly productive farms. However, the whole process of development, which has been described more fully by G. L. Banfield in the April, 1947, issue of "The New Zealand Journal of Agriculture," has been long and costly.

## Drainage

One of the characteristics of peat is that when it has been thoroughly dried out it is difficult to re-wet. It is commonly, but erroneously, believed that this difficulty is due to the waterproofing action of the resins in the peat. Experimental work in other countries has shown that the large air spaces between the particles cause airlocks which hinder the movement of water. It has been demonstrated in the laboratory of the Soil Research Station that peat from which the resins have been removed is as difficult to re-wet as untreated peat. In special instances there may be small pockets of peat, for example, on the site of resinous trees, where there is sufficient resin to have a waterproofing effect, but these instances are the exception and not the general rule.

Drying out in the summer and autumn is a general seasonal occurrence on most soils. However, it has more serious consequences on peat land because, owing to this characteristic difficulty in re-wetting, rain which would cause an autumn flush of pasture growth on ordinary soils may be insufficient on peat and by the time the peat becomes properly moistened the colder temperatures may prevent good pasture growth. For instance, in March, 1949, when soils in the Waikato were generally very dry, a fall of nearly 3in. of rain in 24 hours which caused a flush of pasture growth on the rolling country moistened only the top ½in. of peat except where the water had run into hollows.

There is little doubt that this drying out is one of the principal factors limiting production on many overdrained areas where deepening of the drains has proceeded faster than the burning off or consolidation of the peat, with the result that frequently during summer and autumn there are several feet of dry peat between the water-table and the surface.

Though draining down to the underlying strata and burning off may have been satisfactory for the shallower peat at the fringes of the big swamps, it would present difficulties on the deeper peat. However, the water has to be removed somehow from the surface layers before farming can proceed, and closely placed subsidiary drains are necessary if deep drainage is to be avoided. For instance, in the deep peat regions of Scotland subsidiary drains 2ft. 9in. deep and 20 to 25yds. apart are recommended. To avoid interfering with farming operations these are usually covered. The cost of such a drainage system would probably be prohibitive under New Zealand farming conditions.

The results of some recent preliminary experiments with mole drains on the Rukuhia peat near Hamilton and the experiences of a few local farmers over a period of years suggest that mole draining has some promise of providing a satisfactory method of obtaining sufficiently closely spaced subsidiary drains, provided there is not too much timber in the peat.

IN the November, 1946, issue of "The New Zealand Journal of Agriculture" an outline was given of the projected organisation and work of the Rukuhia Soil Research Station, Hamilton.

The principal object of the station is to enable the instructional staff of the Extension Division to improve the service it provides for the farmer. This is achieved in two ways: First, by fundamental investigations into the nature and measurement of soil fertility to provide better techniques and background for the instructor, and, second, by the intensive study of particular problems as they arise in an instructor's district, which usually entails chemical examination of samples forwarded to the laboratory. In certain cases the method of pot experimentation is used or specially designed field trials are laid down.

This article by F. B. Thompson and I. L. Elliott is the first of a series dealing with progress made in specific lines of research during the past 3 years.. Later articles will deal with spray irrigation of permanent pastures; factors influencing the value of agricultural lime; earthworms; and the use of test kitsets in a soil advisory service.

—R. E. R. GRIMMETT,

Superintendent, Rukuhia Soil Research Station, Hamilton.

## Control of Water Level

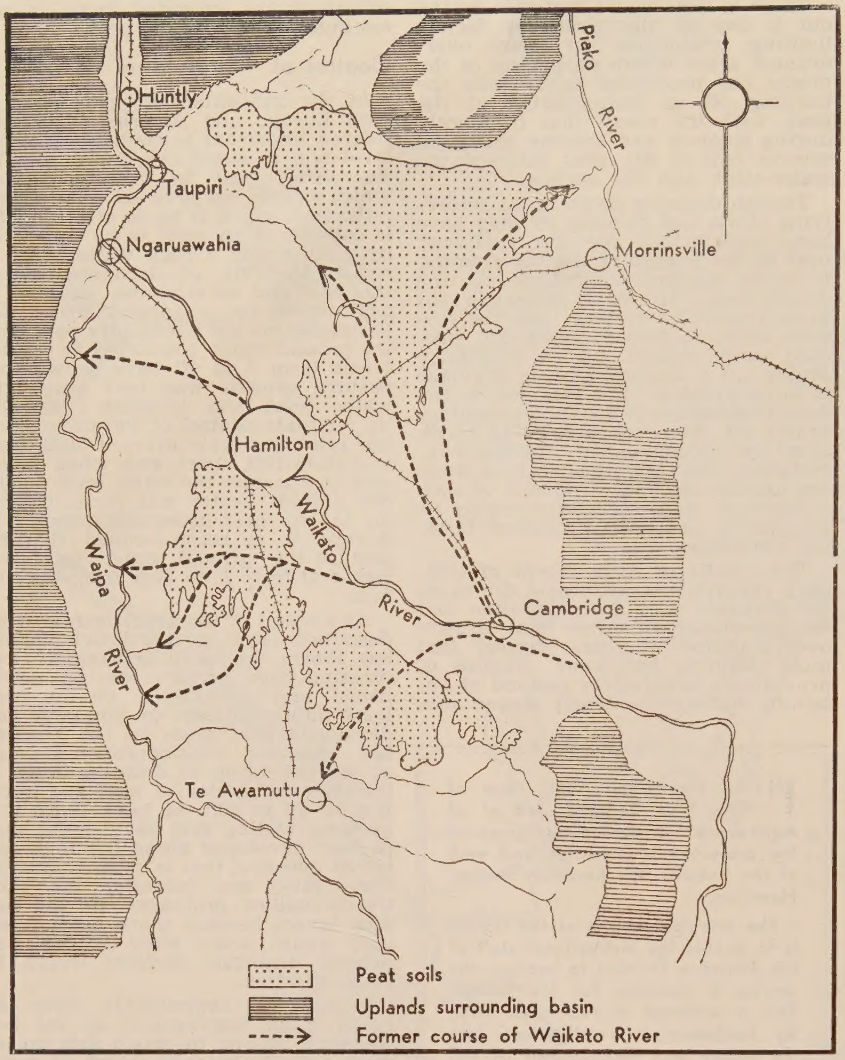
In the utilisation of peat lands in both Europe and America it is considered important to control the water level and to avoid overdraining. The Everglades peat in Florida, U.S.A., which covers an area of 4000 square miles and which is up to 8ft. in depth, is considered an asset to be conserved by maintaining a high water level to reduce the rate of decomposition of the peat and to minimise the risk of destruction by accidental fires. Experiments on the Everglades peat with the ground water controlled at various levels from 1 to 4ft have shown that pasture growth was best when the water level was between 1 and 2ft. To facilitate control of the water level the peat was mole drained 30in. deep and 12 to 18ft. apart, and, when necessary to maintain the water level during dry periods, water was pumped back on to the peat from the canals. In Europe it is recommended that for pasture the ground water be maintained at from 21 to 27in. from the surface.

As a result of the experimental work described later in this article, which has shown that with appropriate topdressing good pasture can be established and maintained on the peat, local public interest in the large undeveloped peat areas in the Waikato has increased considerably. Because of the difficulties in draining down to the underlying clay or sand and burning off 20 to 30ft. of peat, there is a growing feeling that these areas may be best developed along the lines followed overseas, that is, with controlled water level and intensive but relatively shallow drainage. As the surface layers become more decomposed they would drain more readily and normal drainage systems would be more effective.

Laboratory experiments have already been commenced at the Soil Research Station to obtain data on the most suitable level at which to maintain the water in Rukuhia peat under the local rainfall conditions. Larger-scale field trials are also planned, but it will be some years before recommendations can be made regarding drainage. In the meantime it is stressed that over-drainage may be worse than inadequate drainage, because plants are more likely to die from lack of moisture in autumn than from waterlogging in winter. Therefore, it may be better to have the peat moist in autumn, though wet in winter, than to have it dry in winter and too dry in autumn.

## Results of Experimental Work

The main experimental area is on a portion of Mr. E. G. Houchen's farm at Rukuhia, 3½ miles south of Hamilton and ½ mile from the Soil Research Station. The peat which has been leased from Mr. Houchen is partly drained Rukuhia peat about 25ft. deep. A number of experiments are also being conducted on Kaipaki peaty loam on Mr. C. J. Brooke's farm, 4½ miles north-east of Hamilton and on the edge of the Ruakura swamp.



*[Adapted from map in Department of Scientific and Industrial Research Bulletins Nos. 76 and 48.*

Some former courses of the Waikato River in the Hamilton basin.

This peaty loam is well consolidated and about 2ft. deep. Some more recent experiments are located on Rukuhia peat 20ft. deep on property of the Department of Lands and Survey in the Hauraki Plains. The co-operation of these two farmers and the Department of Lands and Survey has greatly facilitated the progress of the experimental work.

The research work as a whole, which includes field trials and chemical analyses, has shown that the nitrogen in the peat is relatively unavailable to plant growth. This is because the large quantity of carbon in the organic matter of the peat locks up the nitrogen. Consequently, plants on peat land suffer from an acute nitrogen deficiency, and grasses such as perennial ryegrass, which is a heavy nitrogen feeder, cannot thrive on peat.

On experimental plots on very poor pasture consisting mostly of Yorkshire fog heavy applications of nitrogen resulted in an extraordinary increase in the growth of the grasses generally. The ryegrass on the treated plots improved so much that it largely replaced the Yorkshire fog, whereas in the untreated paddock it was difficult to find any ryegrass. The effect of the nitrogenous topdressing was relatively short lived, and the cost of the repeated applications necessary to maintain good growth would be prohibitive.

**Therefore, although the deficiency of available nitrogen is one of the main difficulties in getting good pasture on peat, the use of nitrogenous fertilisers is not the answer to the problem.**

In grassland farming on ordinary soils adequate supplies of nitrogen for the grasses are maintained at most times through the clover plants.

Clovers, in common with other legumes, are able to utilise the nitrogen of the atmosphere by the aid of bacteria. This nitrogen is used in synthesising the protein matter in the clover leaves and most of it is excreted by the grazing animal in a form readily available to plants. The nitrogen in the soil is also augmented by the breakdown of the nodules in the clover roots. On peat land the available nitrogen supplied by this method is usually inadequate for the requirements of ryegrass because the pasture, if not devoid of legumes, has only a few plants of small size and little vigour. Therefore, the earlier experimental work centred round ascertaining the conditions necessary for good growth of clovers with a view of increasing the available nitrogen to a stage where ryegrass could thrive. The results have shown that topdressing with potash and phosphatic fertilisers is the main requirement for good clover growth on peat generally and that lime is also necessary on acid peat.

## Liming

The experiments have shown that white clover is unable to establish on raw peat because of the extremely acid conditions. The acidity or alkalinity of soils is usually expressed in terms of what is known as the pH scale. On this scale pH 7 is neutral and figures below 7 denote acid conditions and those above 7 alkaline conditions. Each decrease of 1 pH unit represents a tenfold increase in acidity. Thus pH 4 is 10 times as acid as pH 5 and similarly pH 5 is 10 times the acidity of pH 6. Soils may vary in pH from 3.5 to 9, but in general the mineral soils in the Waikato have a pH of between 5.5 and 6.5, a range which is satisfactory for pasture plants over most of New Zealand. Raw peat has a pH of 3.5 to 4.5. The latter figure is about the minimum pH limit tolerated by many plants. The experiments showed that white clover and subterranean clover were unable to establish at pH 4. The seeds germinated and the seedlings lived through the cotyledon stage, but later all died. Therefore, in establishing pastures on acid peat one of the first steps is to reduce the acidity or to increase the pH.

On very acid peat, about pH 4, liming at the rate of about 2 tons per acre is required to bring the pH up to the level required for good clover growth. As clover fails to establish under very acid conditions, and as good clover must be obtained to increase the available nitrogen, this quantity of lime is required when the pasture is sown. To achieve good results it should be broadcast and worked into the top few inches of soil before sowing. A programme which allows for ½ ton of lime at sowing down and ½ ton annually for the next 3 years would be unsatisfactory in very acid peat. Most of the clovers which germinated would probably have disappeared from the sward before sufficient lime had been applied to effect the necessary rise in pH.

As a pH range of 5.5 to 6.5 is satisfactory for most pasture plants, liming is usually recommended on mineral soils when the pH is below 5.5. On the other hand, for some reason not yet understood, it appears that a lower pH range is better for pasture

The effect of applying lime, phosphate, and potash to new pasture on deep Rukuhia peat. In this experimental area there is a marked contrast between the topdressed plot (left) and the untopdressed plot (right).

on peat soils. This was the experience found in developing the peat land of Germany years ago, and similar results have been obtained in recent trials in the Waikato. Therefore, until more is known about peat it is considered of no advantage to lime heavily once the pH is in the range 5.0 to 5.5.

Peat which has been either burnt or sufficiently well drained for several years to enable decomposition to proceed may have a sufficiently high pH in the top 3 or 4in. and may not require liming. Burning is quite a good method of raising pH because it destroys the organic acids which cause the acidity and tends to concentrate in the ash bases which neutralise acidity.

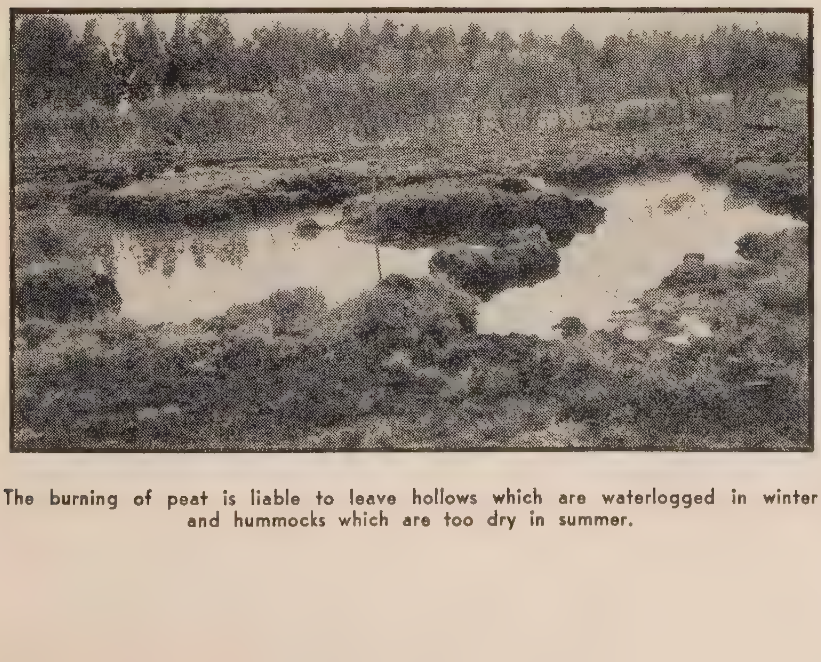
The significance of pH has been stressed in the foregoing because farmers should understand what pH values mean if they are to get the most out of the advisory services given by the Department. This applies particularly on peat land, because in the light of the experimental work and field observations it is felt that much clover seed has been wasted on peat land that is too acid and lime is being applied to no advantage on consolidated peaty loam which has a satisfactory pH. As a rough guide it can be assumed that brown, undecomposed peat which when wet can be moulded like clay requires about 2 tons of lime per acre, but black, friable, decomposed peaty loam needs a few hundredweight only, if any. For more precise advice the local Instructor in Agriculture should be consulted.

## Phosphate and Potash in Peat

The figures quoted at the beginning of this article show that peat contains only a small percentage of mineral matter, compared with ordinary soil, which consists chiefly of mineral matter. Furthermore, peat, particularly when it is undecomposed, is very bulky. When wet it is mainly water, which is replaced by air on drying, and the weight of dry material per acre for any given depth is very much less on peat soils than on mineral soils. This is indicated by the figures, in the table on this page, which show the weight of dry material and mineral matter (or ash) per acre to a depth of 3in. on the peats of the three experimental areas and on a loam soil.

WEIGHT OF DRY MATERIAL AND MINERAL MATTER PER ACRE ON PEAT AND LOAM

| Soil type | Decomposition and locality | Weight of dry peat or soil per acre, 0 to 3in. (lb.) | Per cent. of mineral matter (ash) | Weight of mineral matter (ash) per acre, 0 to 3in. (lb.) |
|---|---|---|---|---|
| Rukuhia peat .. .. | Undecomposed—Hauraki Plains | 50,000 | 5 | 2,500 |
| Rukuhia peat .. .. | Partly decomposed—Houchen's farm, Rukuhia | 200,000 | 30 | 60,000 |
| Kaipaki peaty loam .. | Brooke's farm, Ruakura | 350,000 | 60 | 210,000 |
| Te Kowhai loam .. | Research Station, Rukuhia | 500,000 | 90 | 450,000 |



The burning of peat is liable to leave hollows which are waterlogged in winter and hummocks which are too dry in summer.

The figures clearly show that the peats contain less minerals than the loam soil. Good clover growth cannot be expected on unimproved peat unless the deficiency of all three major plant foods, calcium, phosphorus, and potash, is remedied. In addition to liming, which supplies calcium as well as increasing the pH, some provision has to be made to increase the available supplies of the other two elements in the peat.

Repeated burning of the peat and feeding out of hay on the peat are two practices which have contributed to the successful development of extensive areas in the Waikato over many years. Burning destroys the organic matter and thus concentrates the minerals in the peat, but it has some disadvantages. The deepest burns occur in dry seasons, when the water-table is at its lowest levels. When the water rises the burnt areas are liable to become waterlogged; therefore deep burns should be followed by deepening of the drains. Because the ash has little or no organic matter, it has a low water-holding capacity and is liable to dry out badly in dry seasons. Mixing the ash with some of the underlying unburnt peat is advantageous. Thus, unless appropriate preventive measures are adopted, pasture on deep burns is liable to suffer in both wet and dry seasons.

Another disadvantage of burning is that it is liable to leave hollows which become waterlogged in winter and hummocks which become too dry in summer (see the lower illustration on this page). In addition to advantages arising from consolidation through stock trampling, the feeding out of hay is in effect a slow method of increasing the minerals in peat. Such methods may have been worth while in the past, when the initial out-

Portion of a plot on deep Rukuhia peat topdressed with lime, phosphate, and potash, showing improved pasture of ryegrass and white clover.

lay was small, but in view of the high costs of land development today, a method which will give a substantial return in a shorter time might be more attractive.

## Results of Topdressing

The experiments have shown that when heavy applications of mixtures of lime, phosphate, and potash were applied good pasture could be obtained within one or two years even on the very raw peat. If any one of the three components was omitted from the mixtures, poor results were obtained, except that lime was not required on the peaty loam on Mr. Brooke's farm. This area had previously been limed and the pH was over 5.

In the initial trials a mixture of 10cwt. of serpentine superphosphate, 2½cwt. of muriate of potash, and 2 tons of lime per acre was applied to a pasture on the Rukuhia peat on Mr. Houchen's farm. The paddock had been sown down with a cheap seed mixture in the autumn of 1946 and when the experiments were commenced the following summer the sward consisted largely of Yorkshire fog, with a few weak white clover and ryegrass plants. As a result of the topdressing the clover improved so much that in the spring of 1947 the plots were clover dominant and the following year the ryegrass began to increase considerably. In the meantime the pasture on the untreated paddock gradually deteriorated and has largely reverted to manuka, rushes, moss, and bare ground, and Yorkshire fog is the principal pasture species left.

No seed was sown on the topdressed plots in the course of the experiments, and the improvement in the sward is the result of the fertilisers enabling the better species to thrive and crowd out the poorer ones. The change in the pasture is shown by the illustrations at the top of the preceding page and above, the photographs of which were taken in April, 1949. The plot shown above was initially topdressed in February, 1947, with the mixture mentioned in the foregoing and retopdressed in the autumn of 1948 with 1¼cwt. of serpentine superphosphate and 1¼cwt. of muriate of potash per acre. It should be stressed that the improvement in the pasture on this peat has been obtained in spite of the unconsolidated nature of the peat and the inadequate drainage. For nearly 6 months of the year the water-table is practically at the surface.

The heavy rates of topdressing in these experiments were the quantities chosen for the initial trials and are not the recommended rates. Further trials were started in all three experimental areas to determine the minimum quantities required to produce good pasture.

**It may be several years before this experimental work is completed and final recommendations can be made. However, in the meantime it appears that an application of approximately 4cwt. of superphosphate or serpentine superphosphate and 2cwt. of muriate of potash per acre is required in the first year. Heavier applications will give better results, but it is very doubtful whether the additional pasture growth would be worth the cost of the extra fertiliser.**

It is equally doubtful whether on peat similar to that on the experimental areas it would be worth while applying much less than the minimum quantities mentioned above. For instance, on Mr. Brooke's farm a mixture of 2cwt. of serpentine superphosphate and 1cwt. of muriate of potash per acre was very little better than no fertiliser at all.

All peat land does not necessarily require the amount of topdressing recommended above. On areas which have been deeply burnt there may be sufficient minerals for the immediate

Soft turnips growing on peat burnt the previous year on Mr. E. G. Houchen's farm, Rukuhia.

requirements of pasture growth, but the necessity for topdressing may arise in subsequent years as the minerals are used up or lost by leaching. The heavy applications of potash in particular may be unnecessary on peat which contains alluvial deposits of silt and other mineral matter. For instance, a gully of peat between two ridges may receive sufficient mineral matter in the wash from the adjacent hills to supply the potash required for the pasture.

The muriate of potash used in these experiments contains about 60 per cent. potash and is therefore about double the strength of the 30 per cent. potash salts which were on the market before the war. Although the muriate is expensive—about £28 per ton in the Waikato at present—several farmers who have tried it on peat are so satisfied with the results that they intend putting it on all over their farms at the rates of 1 or 2cwt. per acre.

In the experiments, the phosphate has been applied either as superphosphate or serpentine superphosphate. Possibly other forms of phosphatic fertilisers may be equally good or better, and trials have recently been commenced to compare various types of phosphatic fertilisers, but it will be some time before the results are obtainable. The main thing is to apply some phosphate with the potash, except possibly on areas that have been heavily topdressed with phosphates during the last few years.

The effect of phosphate and potash on deteriorated 7-year-old pasture on Kaipaki peaty loam. The vigorous white clover dominates the sward and has crowded out the weeds.

Controlled grazing reduces regrowth of scrub. The enclosure in the right foreground was periodically heavily stocked during the previous 12 months. The other area was subject to light and continuous grazing.

## Best Time to Apply Fertilisers

Questions are frequently asked regarding the best time to apply these fertilisers. As the main object of the potash is to stimulate clover growth, the maximum benefit would result from applications made just before the clovers normally put on the most growth, that is, in the spring. For this reason, and also because potash is liable to be leached out during the wet weather in winter, it is preferable to apply it in spring rather than in autumn. However, because of other work in spring and the danger of the potash setting in hard lumps if kept during winter, the farmer may have to apply it at other times of the year. In an experiment on the peaty loam the fertilisers were applied in June and there was an extraordinary increase in the clover growth in the hay crop the following summer.

As the object of topdressing is to increase the legume growth and thus increase the available nitrogen so that ryegrass may thrive, it is not worth applying the fertilisers recommended if there are practically no clovers or *Lotus* in the sward. In two experiments, one on a sweet vernal-dominant pasture and the other on a Yorkshire fog-dominant pasture, applications of even 10cwt. of serpentine superphosphate and 5cwt. of muriate of potash per acre had very little effect because there were practically no legumes in the swards to respond to the fertilisers.

If there are clovers in the sward, even though they are very small-leaved and sickly, clovery pasture such as that shown in the illustration on the left may be expected from the topdressings recommended, and in the grazing of these pastures precautions may have to be taken to avoid bloat in stock. Therefore on farms entirely on peat the whole area should not be topdressed in the one year with the phosphate-potash mixture recommended. If the topdressing programme were spread over, say, 3 years the area first treated should have settled down to a better ryegrass-clover mixed sward when the last treated area is still in the clover-dominant stage.

The ultimate benefit from the topdressing depends not only on the clovers in the sward but also on the grasses. If there were only browntop and no ryegrass, there would not be much benefit from the topdressings, because browntop does not respond as much as ryegrass to the increased available nitrogen resulting from the clover growth. If the pasture does not contain both legumes and some good grasses, it would be advisable to resow with better species before applying the phosphate-potash mixture.

## Ryegrass-White Clover Trials

Encouraging results have been obtained from trials to determine whether a good ryegrass-white clover sward can be established directly on raw peat when appropriate fertilisers are also applied. The best results so far obtained are on an area of raw unconsolidated peat in the Hauraki Plains. The area was previously in scrub more than 6ft. high and in the autumn of 1948 a fire cleaned up the scrub without burning the peat. After discing and rolling, a good ryegrass-white clover mixture was sown late in April with 2 tons of lime, 2cwt. of superphosphate, and 1cwt. of muriate of potash per acre. The phosphate-potash dressings were repeated the following November and by the beginning of 1949 there was an excellent ryegrass-white clover sward. The lime was disced in to raise the pH in the top 6in. of peat. This enabled the pasture roots to go down more deeply and thus reduced the risk of the pasture suffering when the surface layers of peat dried out in summer.

Further experiments are being conducted to determine the quantities of fertilisers required annually to maintain the good mixed pasture resulting from the initial heavy applications of fertilisers. From preliminary results it appears quite unnecessary to repeat the heavy applications. The plot shown in the illustration at the top of page 106 was retopdressed with 1¼cwt. of serpentine superphosphate and 1¼cwt. of potash per acre in the second year. This was quite adequate and possibly more than adequate to maintain the pasture.

As the experimental work has been in progress for 3 years only, information is not available regarding the topdressing required in subsequent years. However, it is expected that less potash would be required annually (unless the paddock were used for hay or silage) because most of the potash in the pasture is returned to the soil in the stock urine. Furthermore, the added fertiliser should stimulate the micro-organisms in the peat and thus accelerate the decomposition of the peat and liberate more mineral matter. The pasture should also benefit from the additional consolidation of the peat through the increased stocking which would result from the additional pasture obtained from the initial topdressing. Thus the initial heavy topdressing is like money invested at compound interest, and smaller applications should be required in subsequent years to maintain the pasture.

## Importance of Grazing Management

It has been stressed that the aim in improving pastures on peat land should be to stimulate clover growth and thus increase the nitrogen available in the grasses. The grazing animal is an important link in the chain of events because the animal is the means by which the nitrogen of the clover leaves, which comes from the atmosphere, is returned to the soil in a form readily available to the grass plants. Similarly most of the potash in the pasture is also returned to the soil in an available form through the grazing animal., As the peat is so deficient in available supplies of these two elements, a quick turnover of the pasture through the animal is desirable.

In addition to these benefits and the increased consolidation caused by the stock, controlled grazing is an important factor in preventing the pasture from reverting to manuka and rushes. In one of the earlier experiments a 1-acre enclosure was topdressed with nitrogenous fertilisers and subjected to intensive periodical grazing. In the surrounding paddock, which was part of a larger area and which was grazed by a few stock under conditions typical of the grazing of many areas of partly developed peat, the manuka and rushes grew several feet within 12 months. On the other hand the enclosure remained comparatively clear of scrub. The difference between the two areas, which is illustrated at the top of the preceding page, is attributed largely to the difference in the grazing, because the nitrogenous topdressing in the enclosure had little permanent effect.

## Topdressings of Minerals

Topdressings of minerals are sometimes recommended to keep stock healthy. I. J. Cunningham has shown that practically all reclaimed peat land in New Zealand is deficient in copper and that this is the cause of diseases in stock. The trouble is easily remedied by topdressing with 5lb. of copper sulphate (bluestone) per acre yearly (see the October, 1948, issue of "The New Zealand Journal of Agriculture"). Therefore, whatever types and quantities of fertilisers are used to improve the pastures on peat, copper sulphate should be applied as recommended by the Animal Research Division.

It should be stressed that the experimental work described in this article is still in the initial stages and that the results given are in the nature of a progress report and apply to the Waikato and Hauraki Plains peats only. There is still much to be learned, but it is felt that the results already obtained show that a more optimistic view may be taken regarding the development of peat swamps than hitherto.

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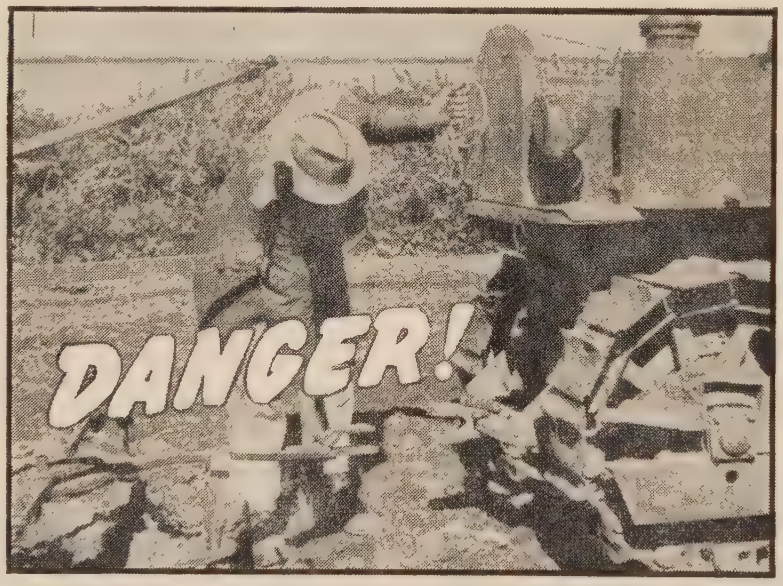

A TRACTOR fitted with a hand-operated clutch offers strong temptation to operate it from the ground when it is being backed to hitch it to a heavy implement. This operation can be carried out relatively easily on a wheeled tractor, but with the crawler type it is more difficult. However, ingenious tractor drivers such as the one shown above have devised a method of doing it with the aid of a piece of rope with a loop over the hand clutch. The danger of such a practice cannot be too greatly stressed. Slightly too heavy a pull may cause the clutch to engage fully and the tractor will move back rapidly to crush the driver against the implement. A sticky clutch or weak clutch springs will also contribute to this danger. The tractor shown above weighs more than 15,000lb., so what chance has the driver if he is crushed against the plough?

**Never engage a clutch except from the driver's seat, and never dismount from a moving tractor.**

—*C. J. CROSBIE, Farm Machinery Instructor,*
*Department of Agriculture, Christchurch.*

## Tours a Y.F.C. Feature

EDUCATIONAL tours of farming districts of New Zealand have become an important feature of the winter activities of the Federation of Young Farmers' Clubs. One tour took place this month and arrangements have already been made for 20 other inter-district tours, most of which will be held in May and June.

The majority of the tours are so arranged that members of clubs in one district travel to another district, where they are billeted for a period with club members of that district. Other tours utilise special transport facilities and hotel accommodation to cover larger areas of country. During such trips sightseeing and visits of an educational nature to farms and factories are combined.

The tours do much to instruct young members in the farming methods of other districts, develop a Dominion-wide outlook, and encourage friendships.

◆

# Serious Sources of Contamination of Milk and Cream

By L. J. FRASER, Special Inspector, Dairy Division, Department of Agriculture, Christchurch.

**INDIRECT contamination of dairy produce by absorption can be very considerable and in a large number of cases is the cause of milk and cream of unsatisfactory quality being delivered to manufacturing dairies. The information in this article is additional to that in previous articles on contamination arising from uncleanliness of the interior of milking sheds and of milking machines and equipment; the intention is to convey the seriousness of the deleterious effect on dairy produce quality from such sources as unsatisfactory skimmed milk disposal, unsatisfactory surroundings, and proximity of piggeries, etc., which all affect the raw material or produce in a series of ways, both directly and indirectly.**

THE efforts of Farm Dairy Instructors have gone a long way toward eliminating these sources of contamination, but the ultimate result involves the unfailing co-operation of the dairy farmer himself, as he has complete control of his dairy premises.

After the farmer has received instruction from the Department's officer the issue is in his hands to maintain that standard of sanitation in the surroundings of his premises and not just at odd times when he may anticipate the Farm Dairy Instructor's periodic visit of inspection.

If one supplier can make an effort to carry out the helpful instructions of the Farm Dairy Instructor, others also can be co-operative and show that necessary desire for the raising of the all-round standard of milk and cream delivered to the dairy factory, ultimately benefiting from the increased average grade of butter or cheese produced throughout the country. Individualism is the keynote to clean milk and cream production.

**The produce from one shed with unclean surroundings will affect the combined production from a large number of sheds where the surroundings are all that can be desired.**

## Unsatisfactory Skimmed-milk Disposal

A brief description of the component parts of whole milk and skimmed milk is given so that the change that takes place when whole milk is separated may be visualised. When the separating process is completed the properties of the resultant cream and skimmed milk are totally different both physically and quantitatively; that is to say, the balance or equilibrium of the whole milk is upset in the separating process. It is the equivalent of what occurs in the case of a human being when an amputation is performed; the balance of the body is considerably altered, although some form of artificial assistance may be provided. The assistance given to cream, in order to maintain as low as possible the lactic acid content, is embodied in the process of adequate cooling and the prevention of bacterial contamination from sources such as fermented skimmed-milk containers or from other serious sources, which will be outlined later in this article. Pure whole milk and cream, if not controlled in respect to the formation of lactic acid, will ferment and become unusable as individual products; hence the necessity of keeping the skimmed-milk container, whether clean or otherwise, well away from the shed and dairy. The constituents of whole milk—the fat is in emulsion and the solids in solution—and an analysis of skimmed milk on a percentage basis are as follows:—

| Whole milk | Per cent. | Skimmed milk | Per cent. |
|---|---|---|---|
| Water .. | 87.54 | Water .. .. | 90.6 |
| Fat .. .. | 3.71 | Fat .. .. | 0.1 |
| Casein .. | 2.63 | Lactose .. | 4.9 |
| Albumen .. | 0.31 | Protein .. | 3.6 |
| Globulin .. | 0.11 | Ash .. .. | 0.8 |
| Protcose peptone .. | 0.13 | Vitamins: All water-soluble vitamins of milk present. | |
| Other nitrogenous substances .. | 0.11 | | |
| Lactose .. | 4.70 | Fat-soluble vitamins negligible. | |
| Ash .. .. | 0.76 | | |

### Lactose or Milk Sugar

Lactose or milk sugar, which constitutes nearly 5 per cent. of skimmed milk, is the source from which all lactic acid is derived when the process of souring takes place in the skimmed-milk container. At a temperature of 60 to 70 degrees F. lactic acid bacteria work at a high rate, producing acid from the available lactose. Milk sugar is a food for various micro-organisms, which find their way into the skimmed milk even though every care is taken in covering containers or keeping the temperature to the desired limit. Souring skimmed milk gives off a pungent odour from the container, due principally to the presence of carbon dioxide gas, acetyl-methyl, carbinol, di-acetyl, and butyric acid, the last two causing the powerfulness of the odour. The foregoing all leads up to the problem of efficient skimmed-milk disposal. Before the advent of the skimmed-milk pump, the residue from milk separation was usually held in wooden barrels or steel drums until properly soured before being transferred to the piggery.

Today this method of collecting and holding skimmed milk is looked upon as most insanitary, especially if the containers are not regularly washed, thereby creating or setting up advanced fermentation of all additional skimmed milk held in these containers.

If the receptacle is kept absolutely clean after each milking has been dealt with, this method of disposal is considered preferable to a sour or leaking skimmed-milk pump which is not cleaned in the proper manner and allowed to fall into disrepair.

Should the skimmed-milk drum be allowed to remain unwashed and close to the dairy or shed, the result will be disastrous, as the accumulated bacteria of fermentation will find their way into every crevice of the milking plant, dairy, and utensils, eventually coming in direct contact with the milk

*[National Publicity Studios photo.*

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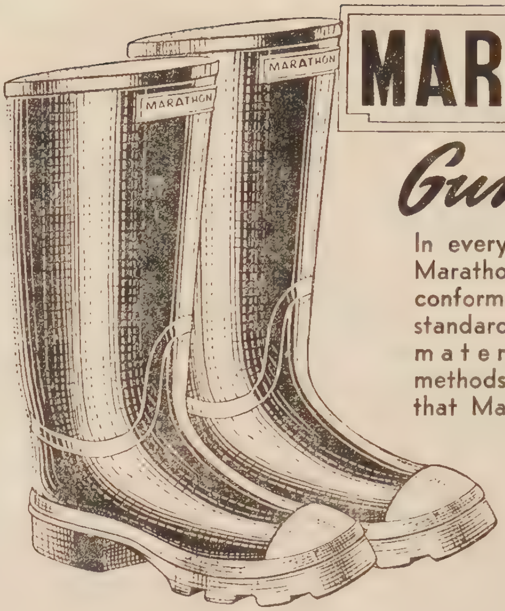

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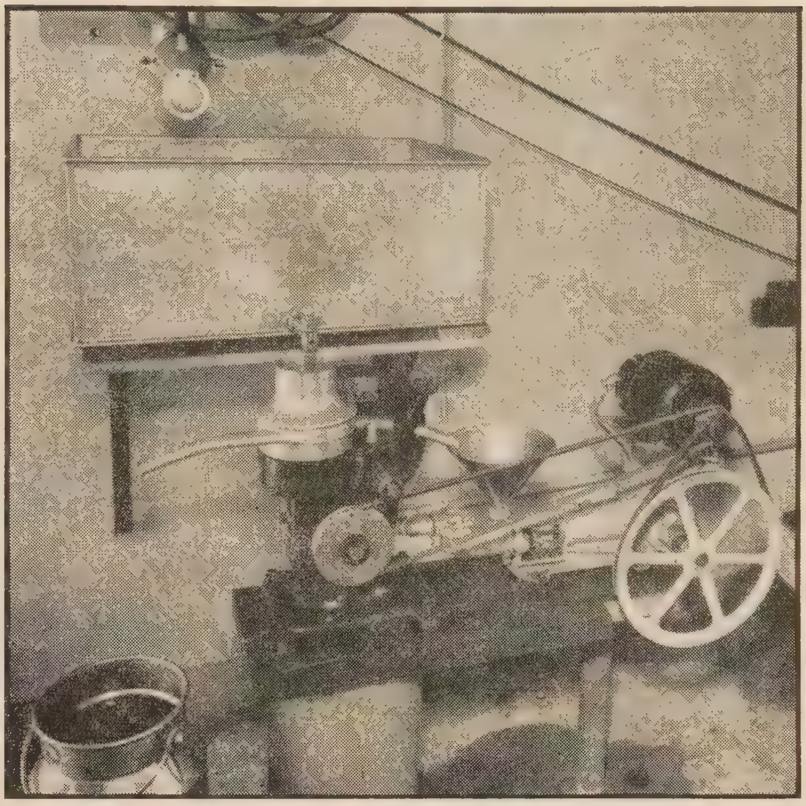
2.9A

or cream. Milk at normal animal temperature, about 95 degrees F., on being released from the milking machine will absorb a certain amount of ferment bacteria; cream also when leaving the separator or running over the cooler will be affected in a similar manner, with the result that the normal acidity of both will be increased more rapidly than milk or cream held in a bacteria-free atmosphere, provided the temperature is identical in each case. Currents of air will be heavily laden with ferment bacteria when flowing into the dairy if the containers are in the direct path of the prevailing wind and, of course, close to the dairy. Where large quantities of skimmed milk have to be disposed of each day barrels or drums are not considered satisfactory, as their cleaning would entail much work and at times would probably be neglected, so that the installation of a skimmed-milk pump would expedite the work at the shed and also eliminate any chance of direct contamination from fermentation.

When smaller quantities of skimmed milk have to be handled a skimmed-milk carrier or container on wheels can be employed. It is a suitable and inexpensive contrivance and a number of dairies in the South Island use one. The conveyer is similar in construction to the dust-bin carriers used in some cities, but is on a heavier and slightly higher chassis. When not in use the conveyer is kept at the piggery, which is required by law to be 50yds. from the dairy premises. Under no circumstances should fermented skimmed milk be allowed to remain near the dairy or milking shed.

The skimmed-milk pump may also be a source of contamination unless the owner ensures that all glands are tight and properly adjusted, so that leakage does not occur and liquid is not ejected on the floor of the separator room. To be properly installed a pump must have the intake side fitted with a tinned hopper, and all piping from the hopper to the pump must be of tinned brass or copper with a rapid union fitted to allow for easy dismantling of the pipe at any time and to serve as an easier means of detaching the pipe and hopper for extra cleaning and general inspection. Skimmed milk if allowed to accumulate on the outer cover of the pump will cause just as much trouble to the supplier and in the same way as bacteria from outside the building. Concrete floors will be seriously damaged by the acidity developing from the deposits of leaking pumps. The presence of numerous flies around some milking sheds also could be attributed to fermented skimmed-milk containers, which create a regular incubator for the larvae of house flies, which usually cause restlessness among cows in the yard at milking time.

Milk or cream produced under conditions where contaminating influences such as those already described are present will be of unsatisfactory quality and the grade allotted to it at the receiving factory will depend upon how rapidly the bacteria absorbed have developed. During periods of high atmospheric temperature the absorbed contamination from unsatisfactory skimmed-milk disposal frequently results in the lowest grading points being allotted.



*[Green and Hahn Ltd. photo.*

An efficient and modern skimmed-milk pump. This hygienic method of skimmed-milk disposal is recommended.

## Unsatisfactory Surroundings

A fairly wide range of faults relevant to the state of the general surroundings of the dairy premises comes under the heading "unsatisfactory surroundings" and the necessity for watchfulness and the need on the part of the milk or cream supplier again to listen attentively to all advice given by the Farm Dairy Instructor is emphasised.

A supplier may declare he is doing everything possible to produce a good article, but is he? Every effort may be made inside the shed, but the outside is just as important, in many cases more so, taking into consideration the severity of contamination and the sources of it. Unsatisfactory or bad surroundings may be enumerated as follows:—

Cut-up and unsatisfactory surroundings from the traffic of cows, which provides contamination by dust and from the odour of such conditions.

Insanitary drainage system.

Manure heaps.

A large holding yard which is only partially concreted.

Sour and slime-coated drinking troughs.

Rotting timber and old rubberware, etc., thrown outside the releaser room, thereby creating untidiness.

By practical information and instruction the Department is trying to establish sanitary conditions both inside and outside all supplying dairies in New Zealand in the interest of both the consumers of the produce and the farmers, whose attention is required to make the produce of as high a standard as is humanly possible.

**Cut-up and unsatisfactory surroundings from the traffic of cows:** If cows are allowed free range on leaving the milking bails, the surroundings at the rear of the shed become cut up and create a source of contamination, especially in dry weather, when the yard becomes dusty and, with the traffic of the cows, dust is disturbed and is wind borne to the milking shed. To prevent the dust menace the exit race must be fenced and kept in constant repair, ensuring that the cows go out to their grazing or to a holding paddock well clear of the shed. The exit race must be concreted and efficiently constructed to allow for washing after each milking. In wet weather this source of contamination is just as great, as a strong cowyard odour is ever prevalent from unsatisfactory and cut-up surroundings and yards not concreted.

**Insanitary drainage:** Insanitary drainage is a problem that gives Farm Dairy Instructors continuous serious concern, as in some cases there is natural opposition in the contour of the land and the type of country in

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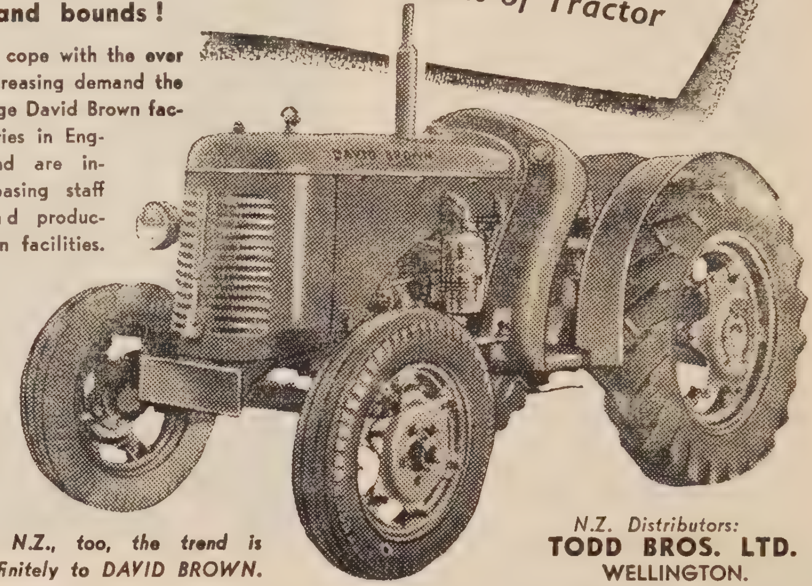

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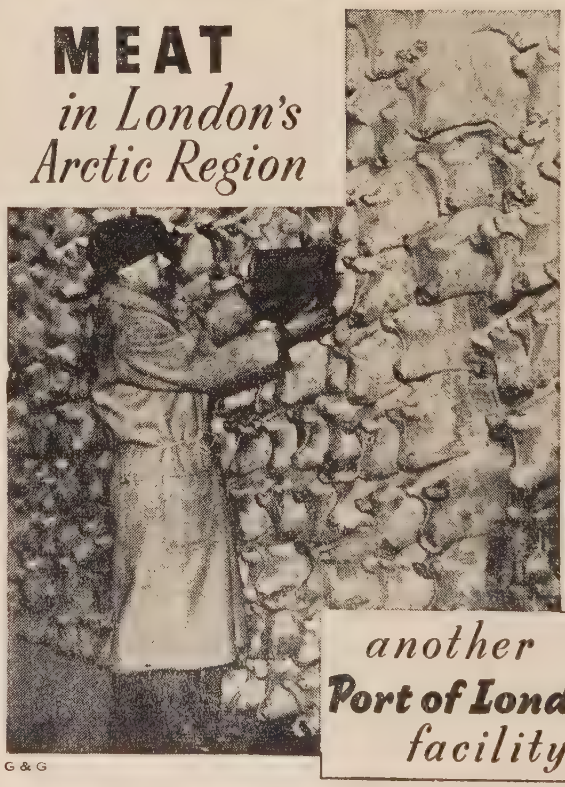

G & G

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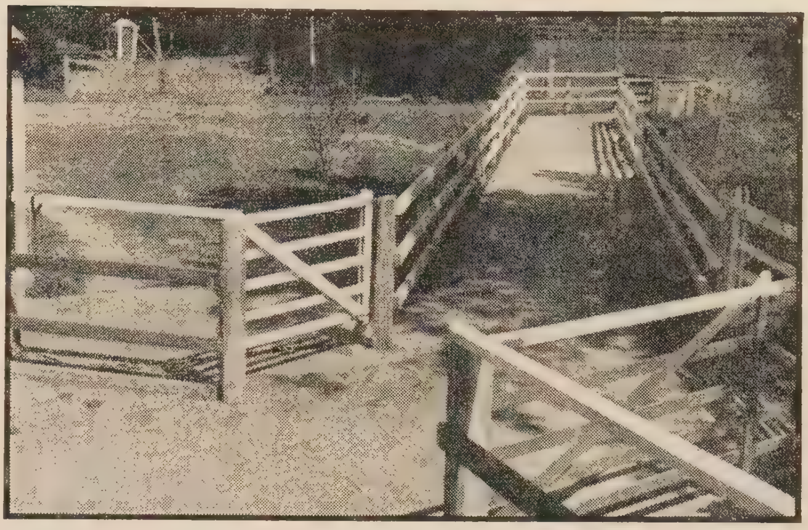
which the drain is being laid. However, these problems are usually surmounted with the co-operation of the owner by making a careful study of conditions. The main objective is to have the drainage running in the correct direction, that is, in a properly constructed drain with the fall away from the dairy portion of the milking shed. This also involves the construction of a suitable and efficient sump which can be readily cleaned of solid material and allow the effluent to flow in a similar direction, possibly to emerge in a gravel pit or into a separate sump, from which a pump could lift the liquid into a tank or spreader for ultimate distribution over the grasslands of the farm. On the edge of the sump a concrete apron must be constructed to allow the collection of solids being lifted and disposed of after the daily cleaning of the yard. (A suitable sump is shown in the bottom illustration on this page.) When the solids are sufficiently dry they can be removed to a safe distance. The use of as much water as can be spared is recommended in the washing of all drains, as a thorough washing and brushing keeps the drain free from obnoxious and pungent odours, which when air borne from the direction of the drain have a contaminating influence on the otherwise clean atmosphere of the shed. All sumps must be constructed at the terminal of the drain and at a distance of not less than 30ft. from the shed and yard.

In view of recent local body requirements every effort must be made by dairy farmers and Farm Dairy Instructors to co-operate with the catchment boards who have laid down bylaws that no solids from shed drains must be allowed to be discharged into watercourses, drains-in-common, or streams under the jurisdiction of boards. These by-laws are in force and must be complied with, being necessary in order to prevent the blockage of streams, county drains, etc., to the detriment of neighbouring farms, especially during flooding.

The answer to insanitary drainage and to catchment board requirements is to keep sumps absolutely clear of solids. By-laws which prevent solids being discharged into streams, etc., have a two-fold purpose, as their enforcement assists catchment boards in keeping streams clean and assists the Department of Agriculture in coping with insanitary drainage.

**Manure heaps:** The quality of milk or cream carefully produced within the precincts of the shed and dairy is detrimentally affected by the absorption of unclean odours arising from manure heaps and any other foreign smell in or about the dairy. Manure heaps also bring about a state of direct infection by bacteria which are air borne or carried by flies to milking shed, milking machines, and utensils allowed to remain in the open air and sunlight for the purpose of drying-off after washing.

A first-class sump for a large shed under construction. Note the large apron provided for the collection of solids.



[*Green and Hahn Ltd. photo.*

Satisfactory shed surroundings are provided by the control of stock on concreted and fenced entry and exit races.

**Where there is no manure heap the incidence of fly infection is reduced to a minimum.**

In wet weather manure heaps become sodden and begin to slip into the yards, directly contaminating otherwise clean concrete and adding to the solids carried to the sump. That strong ammoniacal odour present in manure heaps is air borne to the shed and dairy with the slightest breeze, contaminating the machine and all portions of the plant and ultimately combining with the natural lactic acid in the cream to form ammonia salts, which, when accentuated by the higher fermentation of the skimmed milk, tend to give the cream a strong "off flavour." Manure heaps and unsatisfactory surroundings of long standing are also a breeding ground for putrefactive bacteria, which, working in opposition to the lactic acid bacteria, seriously retard the "natural ripening of milk or cream." In cheese manufacture milk affected with putrefactive bacteria gives the result known as a "slow vat," the lactic acid not developing at its normal speed; hence every effort must be made to eliminate contamination from this source. Suppliers should remove the manure heap daily from near the yard, thus guarding against the possibility of milk or cream developing "cowyard odour," which would automatically contaminate a whole vat of milk at a cheese factory or a vat of cream at the creamery.

**Large holding yard which is only partially concreted:** A holding yard of large dimensions and only partially concreted will cause a great deal of contamination through dust from the uncontrolled traffic or movement of cows. It is comparable to unfenced exits and usually is attributable to poor layout. In dry weather dust is carried by wind and also on the cows' hooves to the shed floor, where, stirred up again by the draught in the shed, it settles on hanging teat cups, enters buckets and other receptacles, or is drawn into the milk line through the teat cups before these are adjusted on the cow. Much of this dust is microscopic. As it is bacteria laden it is most detrimental to the production of clean milk and cream. Also when a yard is dusty cows will stir up the dust and throw it over themselves, thus adding to the nuisance. In Scotland most dairy cows are groomed in the feeding shed before milking, so that contamination from dust and hair is almost entirely eliminated, with the result that milk produced in Scottish dairies is considered the purest in the world.

In wet weather a large yard part of which is not concreted becomes coated in mud, which is carried to the milking shed, resulting in contamination similar to that caused by dust. An indication of this is the vapour or steam rising from the wet mud on animals from the hoof to near the hock, especially if the mud in the yard is deep. This vapour, which is produced by the blood heat of the animal, contains injurious bacteria which are similar in their action on milk and cream to the bacteria in dust.

Dust and mud can be eliminated largely if a systematic layout is adopted when building a shed. The yard and exits should be planned so that they are on the lee side of the prevailing wind, and well-fenced and concreted entry and exit races should be provided so that the movement of cows can be controlled. Where a plentiful supply of water is available a film of

# CONTAMINATION OF MILK AND CREAM . . .

water flowing through the shed and over the surface of the yard also counters the dust nuisance. Some dairy farmers have used the footbath as a means of dealing with mud and dust on cows' hooves, but footbaths, like any other portion of the surroundings, must be kept clean, as if the bath fills with solids it gives off an offensive odour, thus losing its efficiency and creating a further source of contamination.

**Sour and slime-coated drinking troughs:** As a cow's milk contains approximately 87 per cent. of water, it is essential that good, clean drinking water should be easily accessible to the herd at all times.

Cows prefer to drink from drinking troughs, as the water is usually at a more palatable temperature than water from a running stream. The insides of drinking troughs often become coated with green slime and the better method of controlling slime or weed in water troughs is to drain the trough regularly, scour it well with a wire brush, and give it a liberal coating of a good whitewash mixture, incorporated in which is a small amount (1oz.) of copper sulphate (bluestone) dissolved in 2 gallons of the whitewash mixture, applied with a brush to the inner walls and bottom of the concrete trough. In summer the scum develops rapidly because the water is constantly heated by the sun and there is no regular system of draining or cleaning. The addition of slaked lime to the drinking trough is also beneficial as a means of keeping the water pure.

**Heaps of old rotting timber, discarded rubberware, and rubbish deposited outside releaser room:** The necessity for preventing the dumping of old rotting timber near a dairy or milking shed is not always realised. The practice is serious from a point of view of mould contamination to milk and cream. An otherwise clean shed and machine can be contaminated from this source, the farmer's efforts in the shed being worthless if surroundings are not sanitary. Mould is usually air borne, and under favourable conditions, being a fungus, is readily absorbed by warm milk and cream, with serious consequences, as this form of contamination is not detected readily except under the microscopic count during testing of butter or cheese at the laboratory. Old rubberware such as used inflations must never be allowed to accumulate in the precincts of the yard or close to the dairy. If they have been discarded as being insanitary for use in the plant, they should also be regarded as a continued source of insanitation if dumped close to the dairy.

## Proximity of Piggeries

At one time, pig pens were very close to the dairy so that skimmed milk could be conveyed to pigs conveniently. Under the provisions of the Dairy Industry Act, 1908, pigs are prohibited from being brought within a distance of less than 50yds. from the dairy or milking shed. Piggeries kept at this distance and under the latest methods are kept cleaner and the possibility of contamination from this source is considerably reduced.

The pig is one of the cleanest animals if reared under clean conditions, but if a pig pen is allowed to become dirty and not cleaned regularly the pigs themselves become dirty and usually unhealthy.

One of the chief reasons for pig pens being required to be 50yds. from a supplying dairy and the open water supply of a dairy is the risk of air borne odours and bacteria reaching the dairy premises and of direct contamination of the water supply. It is also recommended that the piggery be erected to the leeward of the dairy premises and in a position that allows for efficient drainage. As there is always an odour from a piggery, no matter how well the pens are cleaned, this odour is likely to be carried to the dairy if the pens are in the direct path of the prevailing wind.

Drainage from piggeries must always be attended to regularly and must also flow in a direction that will take effluent well clear of the piggery and not nearer than 50yds. of the shed or dairy. Piggeries also come under the notice of catchment board officials, who expect co-operation similar to that given by owners in respect of drainage from milking sheds.

Pigs, ducks, or fowls of any description on free range constitute a danger to milk and cream quality. Fowl houses and enclosed fowl runs must be located at a safe distance from the dairy premises and as requested by the Farm Dairy Instructor, whose responsibility it is to see that the conditions as laid down in the Dairy Industry Act are adhered to so that no precedent can be established and in fairness to all concerned.

## Important Points

The following 10 points are well worth remembering and farmers' efforts to give effect to them will be appreciated by Farm Dairy Instructors, whose job is to instruct the milk and cream supplier to the best advantage in order to raise and maintain the standard of all dairy produce delivered to manufacturing dairies.

1. Remember the danger of lactic acid formation and fermentation when washing of the skimmed-milk drum is neglected.
2. Watch skimmed-milk pump glands carefully to prevent leakage.
3. The skimmed-milk pump should be equipped with tinned piping and be easily disconnected on the inlet side.
4. Manure heaps should not be left just outside the yard.
5. Drainage systems should work satisfactorily and not be a source of contamination.
6. Dust or mud nuisance in the outer yard or at the exit and surroundings of the shed should be avoided.
7. The formation of slime or weed on water troughs should be prevented.
8. Heaps of old rotting wood beside dairies should be removed.
9. Piggeries should be located in the most satisfactory position and at the correct distance from the shed; also pigs and fowls should not be on free range.
10. If a better average grade for produce is desired, the advice of Farm Dairy Instructors should be followed.

Cleanliness, co-operation, and the will to do a good job pay dividends, both qualitatively and financially and assist materially in the production of a high-class article to meet the competition of other countries on overseas markets.

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# DAIRY PRODUCE GRADED FOR EXPORT

THE following figures showing quantities of dairy produce graded for export during December and for the 5 months ended December 31, 1949, with comparative figures for the same month and 5-monthly period of 1948, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

**BUTTER—**

| Period | Creamery | Tons<br>Whey | Total | Percentage inc. or dec. | Tons<br>Total in store at end of mth. |
|---|---|---|---|---|---|
| December, 1949 .. .. | 22,194 | 403 | 22,597 | — | 47,394 |
| December, 1948 .. .. | 20,844 | 372 | 21,216 | — | 24,739 |
| Increase or decrease .. .. | +1,350 | +31 | +1,381 | +6.509 | +22,655 |
| For 5 months ended 31/12/49 | 90,882 | 1,553 | 92,435 | — | — |
| For 5 months ended 31/12/48 | 80,890 | 1,378 | 82,268 | — | — |
| Increase or decrease .. .. | +9,992 | +175 | +10,167 | +12.358 | — |

**CHEESE—**

| Period | White | Tons<br>Coloured | Total | Percentage inc. or dec. | Tons<br>Total in store at end of mth. |
|---|---|---|---|---|---|
| December, 1949 .. .. | 11,947 | 3,405 | 15,352 | — | 24,048 |
| December, 1948 .. .. | 14,252 | 730 | 14,982 | — | 23,630 |
| Increase or decrease .. .. | —2,305 | +2,675 | +370 | +2.469 | +418 |
| For 5 months ended 31/12/49 | 39,806 | 11,306 | 51,112 | — | — |
| For 5 months ended 31/12/48 | 45,851 | 1,728 | 47,579 | — | — |
| Increase or decrease .. .. | —6,045 | +9,578 | +3,533 | +7.425 | — |

If these figures are converted into butterfat equivalent, there is an increase of 11.285 per cent. in butterfat graded for the 5 months as compared with the corresponding period of the preceding season. It should be noted that the above figures refer only to butter and cheese graded for export, and that owing to diversions which take place from time to time, they are not necessarily a true indication of production trends.

FARMING IN NEW ZEALAND

# Land Improvement

THE first article of this series of four on land improvement, published in the November, 1949, issue, set out a classification of the pastoral lands of New Zealand based on topography, products, and pasture plants and discussed improvement practices on the first four land classes. This article, by P. W. Smallfield, Director of the Extension Division, and S. H. Saxby, Agrostologist, both Department of Agriculture, Wellington, concludes the discussion of class 4 land, dealing with scrubland development and irrigation, and also describes improvement methods for class 5 land — land which is hilly and steep, but of sufficiently high fertility to maintain white clover.

[*"New Zealand Farmer" photo.*

LARGE areas of scrub-covered land in the North Island, comprising pumice land in the central region, consolidated sands on the west coast, and gumlands in Northland, still await the hand of the land improver to turn them into pastoral lands capable of producing milk and meat. As the result of experience and research these lands can now be developed with confidence. Methods of improvement are based on allowing permanent pastures to build up a veneer of fertility on these naturally infertile soils. The land is cultivated so that the seed-bed is fine, firm, and moist to germinate the grass and clover seed sown; fertilisers and lime (if necessary) are applied so that clovers and grasses are encouraged to make vigorous growth; and livestock are concentrated at intervals to promote grass growth through the accumulation of animal manure. In short, a vigorous white clover growth encouraged by phosphates builds up soil fertility to a level which allows perennial ryegrass to become the dominant pasture constituent. The pasture builds its own fertility instead of the older and more costly method of the farmer having to build up fertility through a succession of crops and temporary pastures to the level necessary to allow perennial ryegrass to be dominant from the time of sowing.

These scrublands of the Northland, Auckland, and Wellington Land Districts will provide land necessary for future organised settlement, and much of the development work is likely to be undertaken by the State. These new pastoral areas will also provide an important contribution of new dairy and fat-lamb farms necessary to increase the rural population and the exports required for the well-being of the Dominion as a whole.

## Pumice Lands

The pumice lands of the central plateau area of the North Island consist of soils derived from volcanic-ash showers, and the main areas now awaiting development are covered by the Taupo, Kaharoa, and Tarawera showers. In its natural state the open pumice country, clothed in a tangled mass of manuka and manoao, with tussock on the colder flats and tutu and bracken fern on the hills, looks barren and unattractive. The soils vary from sandy silts to gravelly sands and contain very little organic matter. The Taupo sandy silt (Taupo shower) covers a very large area in the central region; the soil is light and easily cultivated, yet holds moisture fairly well and will maintain white clover. The gravelly sands from the Kaharoa shower and gravels from the Tarawera shower dry out badly in summer; white clover is not permanent on these soils and subterranean clover should be used instead. However, the Kaharoa shower has given rise to soils of varying texture: In the Bay of Plenty where only the finer ash was deposited the soils are medium sands, but at Kaharoa the soils are gravelly sands and at Galatea medium sands with a gravelly subsoil.

The great open tussock plains of the central area first attracted attention as a field for extensive pastoral farming, but except in the southern area where the surface has been sprinkled with Ngauruhoe ash, or in isolated areas such as Galatea where greywacke fans spread over the pumice flats, sheep farming failed because the soils were deficient in cobalt and sheep pined from "bush sickness." But even in the districts where bush sickness did not prevent sheep farming the poor grazing afforded by the tussock pastures and the deterioration in plant cover caused by rabbits and fires steadily decreased the importance of the area for extensive pastoral farming.

In the 1870's and 1880's farming moved up toward the central region from the Bay of Plenty and the Waikato, to be met in both areas with the problem of bush sickness. Settlers could farm the bush-sick lands only from a base that was free from the trouble, and the main bases used were the safe areas in the Matamata-Tirau area, the coastal swamps of the Bay of Plenty, and the lake and river bottoms of Rotorua and upper Waikato. Until the early 1930's pumice land development generally consisted of first sowing a temporary pasture which was mainly red clover and following it with a more permanent one in which cocksfoot and Yorkshire fog were the dominant species at first, but which generally ran out to a browntop or danthonia sward. With the advent of Certified ryegrass seed in the early 1930's and the discovery that cobalt was the cure for bush sickness, land development became simplified. Permanent pastures, composed of perennial ryegrass, cocksfoot, and red and white clovers, were sown after the first ploughing and heavily phosphated to invigorate the white clover growth and so build up soil fertility to the standard required by perennial ryegrass.

## Grassing of Pumice Lands

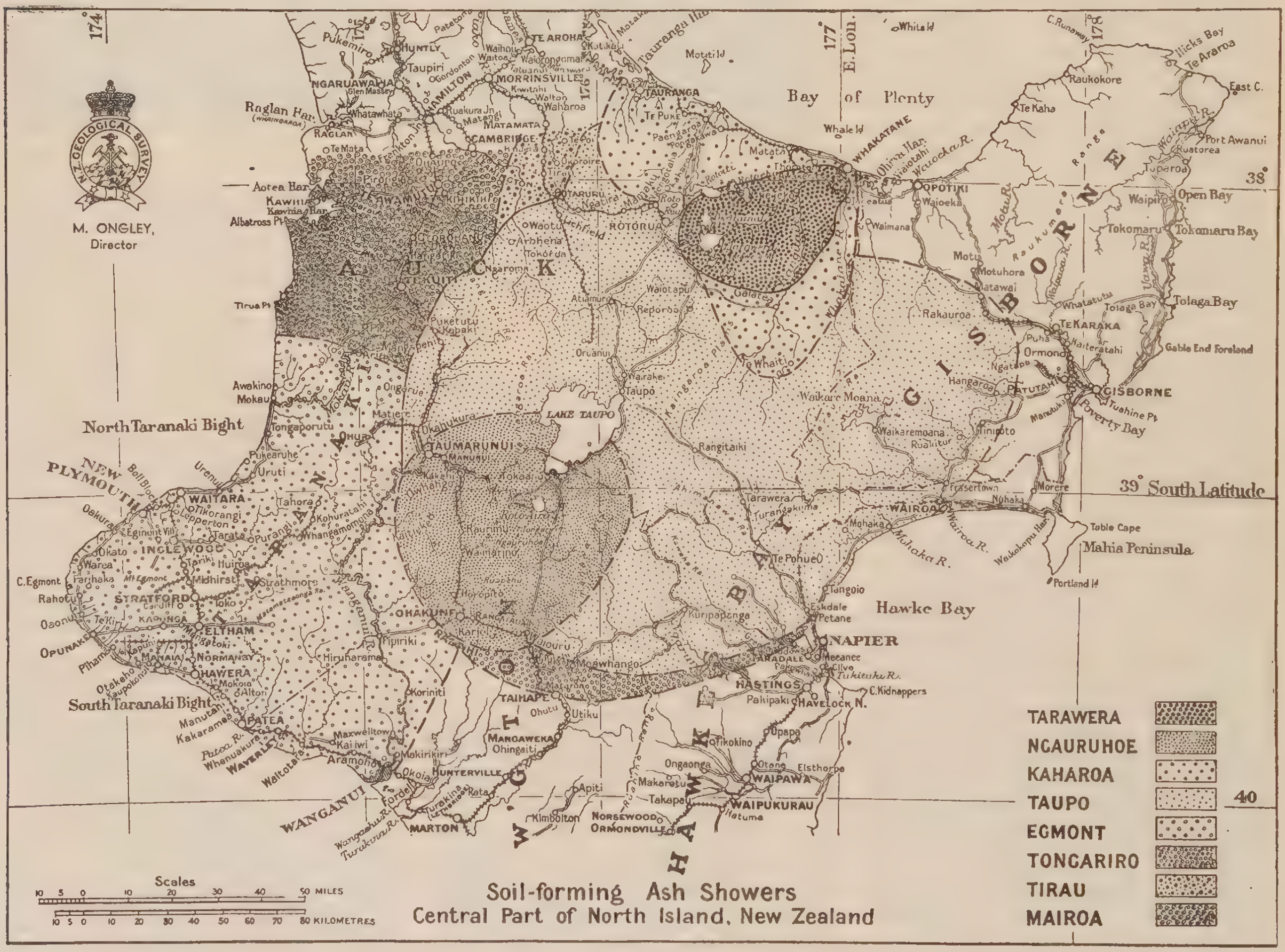
The scrub covering on pumice land should be cleared and burnt before cultivation. Hand cutting or mowing with a scrub bar have now been replaced in large-scale land-development operations by rolling the standing scrub with a heavy flanged roller which crushes and breaks the scrub and allows it to dry out before being burnt. Because of fire danger to forest lands, scrub burning on the pumice land areas is now controlled strictly in many districts and the older clearing method of indiscriminate firing of the scrub several years ahead of cultivation is not allowed.

Experience has shown that the most suitable cultivation for virgin pumice land preparatory to sowing grass and crops is to plough it about 5in. deep with a lea mouldboard plough; leave it fallow for 3 or 4 months to allow the furrow slices to close together (which initially is prevented by the roots and stumps of scrub); then roll the land on the furrow with a Cambridge roller or a special heavy roller; double disc; chain harrow to level the surface; roll it before sowing seed and fertiliser; cover the seed by the use of chain harrows, and finally roll the surface again. Where roots and stumps are heavy, tail plates may be necessary on the mouldboards to allow of the furrow slices being completely turned and pressed together. The seed-bed must be firm for grass and clover seed to strike thickly, and the heavier the roller used for consolidation the better.

Development work during the past two decades has shown that, provided truly perennial strains of ryegrass are sown and the pastures are topdressed annually with superphosphate, productive perennial ryegrass-cocksfoot-white clover pastures can be established after the first ploughing. Perennial ryegrass lacks vigour until white clover covers all the bare ground. Slow growth of ryegrass is caused by lack of nitrogen, but the use of ammoniated superphosphate or sulphate of ammonia to encourage a quick growth of ryegrass has not proved economical.

**Permanent pastures which follow temporary pastures of red clover establish more quickly than those sown after the first ploughing, and for a farmer developing land gradually the method of grassing after a temporary red clover pasture has much to commend it. For large-scale land-development work sowing to permanent grass after the first ploughing is certainly the most satisfactory method.**

On the sandy silts and medium sands which hold moisture the basis of a permanent pasture mixture should consist of 25lb. of perennial ryegrass, 10lb. of cocksfoot, and 2lb. of white clover seed per acre. On the gravelly soils white clover is not permanent and subterranean clover must take its place. Red clover grows luxuriantly on pumice land. The great danger from heavy cowgrass or Montgomery red clover sowings in a permanent mixture is that the luxuriant growth may smother out the perennial ryegrass and white clover plants. However, as a means of building up fertility in a permanent pasture red clover has its uses, provided stock are crowded on during the growing period to keep it in check. The tramping and manuring by the cattle and sheep rapidly improve the pasture sward.



Soil-forming Ash Showers
Central Part of North Island, New Zealand

Permanent pasture on the inland pumice areas may be sown in autumn or spring. At low elevations early-autumn sowings are usually the most successful, but at elevations of more than 1000ft., where early-autumn frosts often cut the young clover plants, spring sowings are usually the most successful.

Pumice land gives a marked response to phosphatic manuring, but in the early stages of pasture development liming is not necessary. Superphosphate is the best phosphatic fertiliser and when grass is sown 3cwt. should be applied with the seed and another 3cwt. within 4 months; this second application encourages the rapid growth of white clover which is essential for the formation of a complete turf.

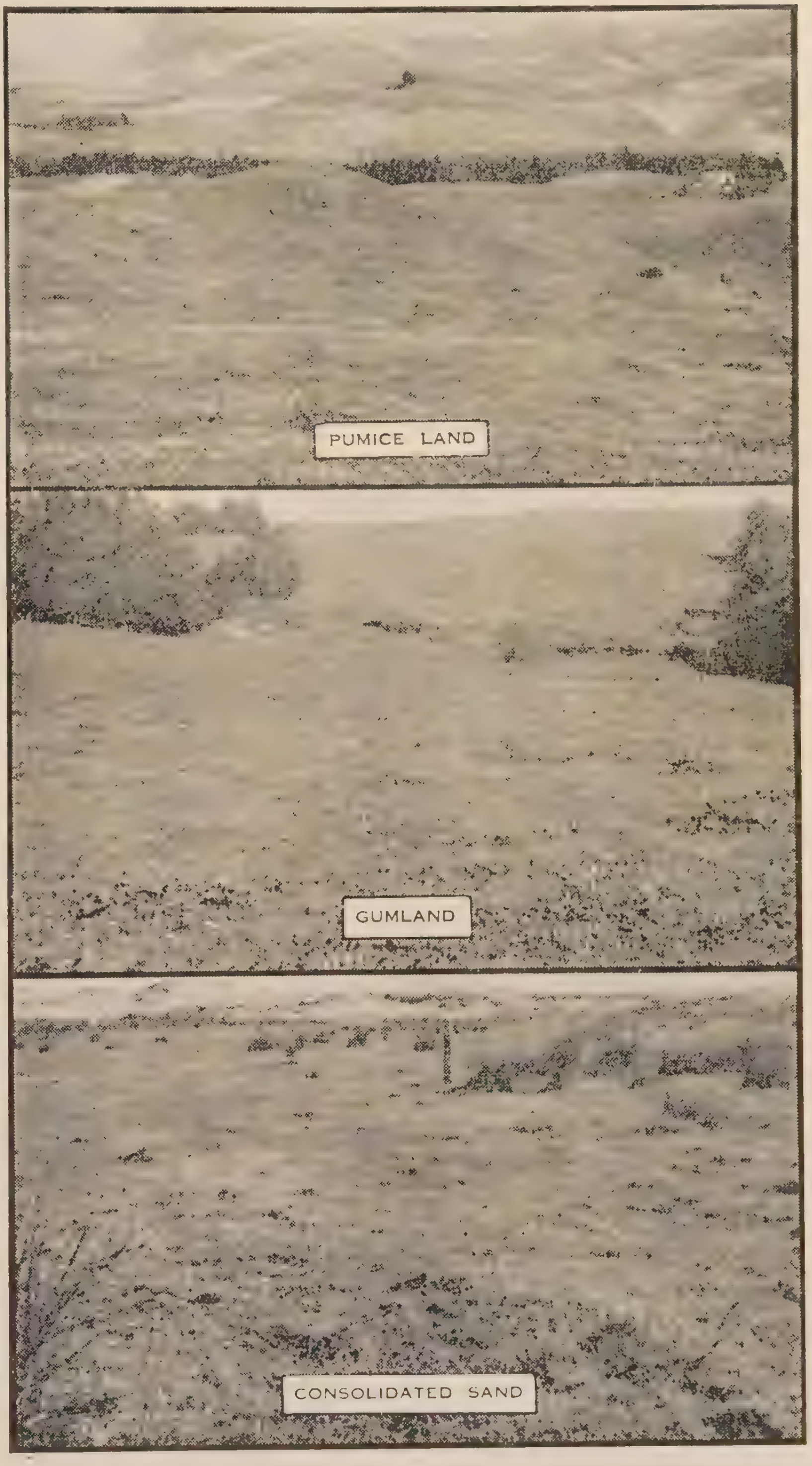
Pasture management is important for the securing of productive perennial ryegrass-white clover pastures. Pastures on land at elevations above 1000ft. are somewhat difficult to manage; the winters are long and fairly severe, yet when spring growth does start it is extremely rapid. Adequate stocking of the pasture during summer necessitates the provision of large supplies of winter feed. With milking cows the essentials are fairly close sub-divisions to allow the fields to be stocked with 12 to 15 cows per acre at short intervals; the use of a mower to control heavy red clover growth; and the provision of hay, silage, and root or green fodder crops (at the rate of ¾ to 1 ton of hay equivalent per cow) for winter feeding. Experience has shown that in its second year permanent pasture on pumice land will produce 100 to 120lb. of butterfat per acre and after a few years, as pastures and herds improve, production can be increased to 150lb. and more per acre.

## Coastal Sands

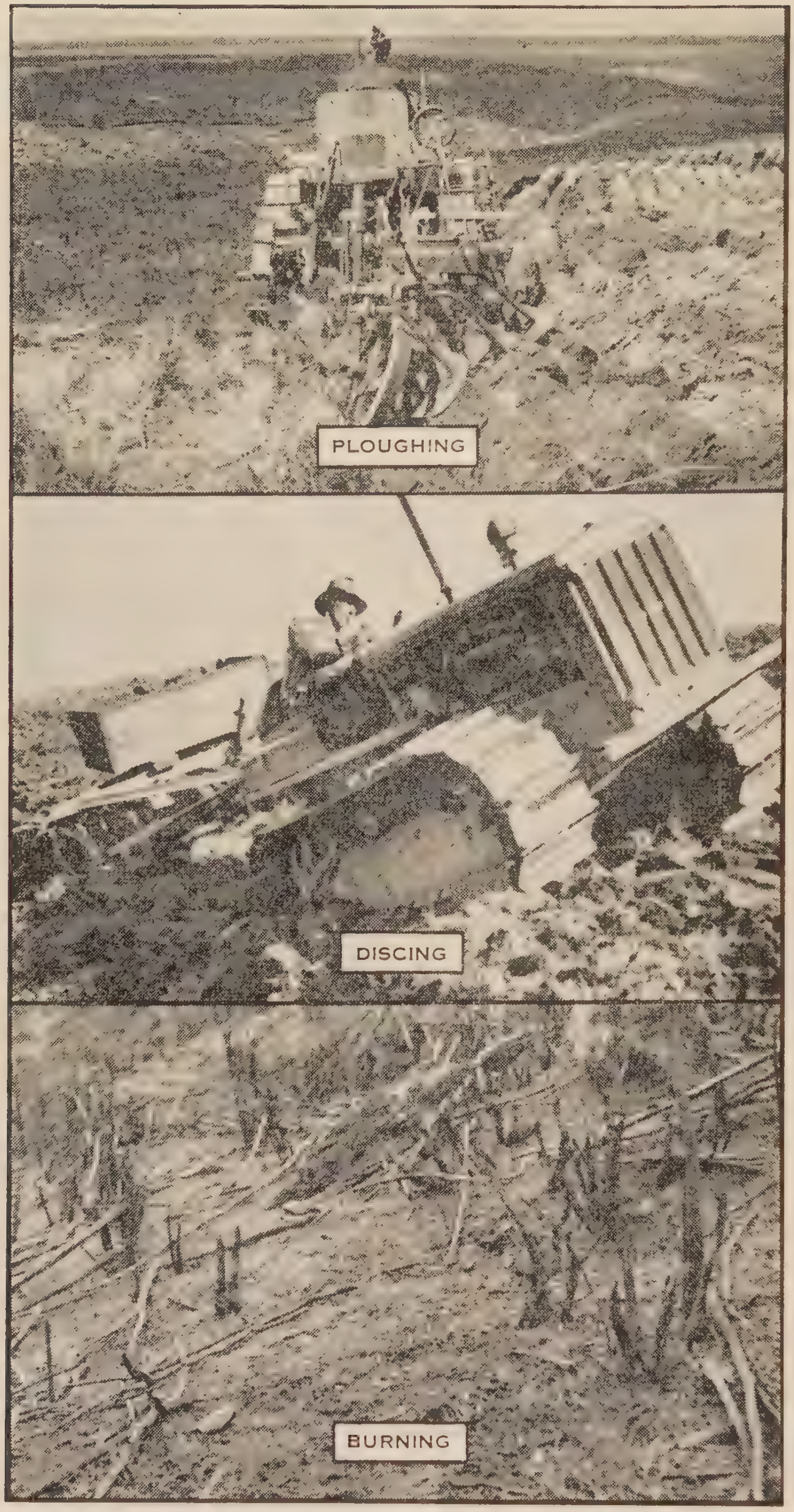
The coastal sand country of the Northland and Wellington Land Districts is a complex of several land classes. Of particular importance are the lagoon areas which enlarge in winter and recede in summer and are suitable for water grasses (class 1), the lower winter-wet flats which will carry strawberry clover (class 2), the higher flats which are not over-wet in winter or over-dry in summer and which will support white clover with topdressing (class 4), the higher and drier country which grows excellent subterranean clover (class 7b), the moving dunes which require stabilising, and leached areas in North Auckland with a complex pan formation (class 7b).

Development of the higher and drier country follows much the same lines as that of the pumice country. Scrub is cleared by burning after cutting or rolling or is ploughed in, and the land rolled, disced, harrowed, and rolled before and after sowing. The basis of the grass-seed mixture is perennial ryegrass and white and subterranean clover, and a general mixture will be composed on somewhat the following lines: Perennial ryegrass 25lb., short-rotation ryegrass 10lb., white clover 3lb., Montgomery red clover 2lb., and subterranean clover 2lb.—a total of 42lb. per acre. Seed should be sown with 3cwt. of superphosphate or serpentine superphosphate per acre; the land should receive another 2 to 3cwt.

## LAND-IMPROVEMENT METHODS



As the result of experience and research large areas of scrub-covered land in the North Island can now be developed with confidence. Methods of improvement are based on allowing permanent pastures to build up a veneer of fertility on these naturally infertile soils. A vigorous white clover growth encouraged by phosphates builds up soil fertility to a level which allows perennial ryegrass to become the dominant pasture constituent.



The land improver should plough all land that can be ploughed, surface cultivate steeper land, and reserve surface sowing after burning for land that can be neither ploughed nor surface cultivated.

per acre 3 to 4 months after the seed has been sown and thereafter be topdressed with 2 to 3cwt. of superphosphate yearly.

The areas containing moister flats which are suitable for white and strawberry clover may be used for dairy farming and the drier, subterranean clover land for fat-lamb production. Situated in the milder coastal climate, the sand areas have a higher autumn and winter grass production than the colder, elevated pumice areas.

## Gumlands of Northland

The cost of gumland development varies considerably: Some areas are only slightly more expensive to develop than pumice land and are within the limits of land class 4, but other areas require more costly cultivation, liming, and draining, and come within land class 6.

The gumlands occur in patches throughout Northland and consist of undulating, treeless downs rising occasionally into low hills. The soils are mature podzols—grey silty loams—being acid and of very low natural fertility. Drainage is poor and rushes and manuka form the natural covering. The gumlands were long neglected for farming and large areas were set aside as gum reserves; the gum diggers turned over the surface soil to a depth of 9 to 12in., dug deep holes, repeatedly burnt off the surface covering, and made subsequent cultivating and grassing much more difficult than it would have been without their interference.

Early work in gumland development followed somewhat similar lines to that described for pumice land development—that is, building soil fertility with a succession of temporary pastures and crops until fertility was raised sufficiently to appear to justify a permanent pasture. Later, as with pumice land, the advent of Certified perennial ryegrass made it possible to demonstrate that, with the use of Certified grass and clover seeds, cultivation which gave a firm, moist, and fine seed-bed to germinate the seed, liming, and phosphatic manuring, the establishment of permanent grass was possible after the initial cultivation of virgin land.

The first stage in gumland development is to fill holes left by gum diggers and to drain wet patches with manuka fascine drains. The land is then ploughed, allowed to weather, harrowed, and reploughed. The first ploughing should be done in autumn and winter and the second in spring. After the second ploughing the land is worked down, kept cultivated during summer, and sown in February if the weather is favourable.

The usual grass-seed mixture for gumland consists of 25lb. of Certified perennial ryegrass, from 5 to 8lb. of paspalum, 3lb. of crested dogstail, 2lb. of cowgrass, 2lb. of white clover, and 1lb. of *Lotus major*—from 38 to 41lb. per acre. Cocksfoot and timothy sometimes replace part of the perennial ryegrass or paspalum seeding, but their use is hardly warranted. Most gumland should receive 1 ton of ground limestone before being sown. The seed should be sown with 3cwt. of superphosphate or basic slag and the land topdressed with 3 to 4cwt. of basic slag or superphosphate 4 or 5 months after being sown.

A border-diked area being irrigated. With summer irrigation land of class 7b can be changed to class 4 or class 6a, depending on the cost of the irrigation works.

Large areas of gumland are still undeveloped, the chief reasons being lack of permanent supplies of drinking water for livestock in summer and the cultivation difficulties of badly dug areas and wet soils.

## Importance of Scrubland Development

Though the pumice, coastal sands, and gumland areas offer scope for organised settlement, the development of innumerable small, neglected areas of scrub and fern on thousands of farms would do as much to increase production. If the moisture-holding capacity of the soil and the rainfall are sufficient to keep white clover permanent, such land on hills, downs, or flats should be considered potential perennial ryegrass-white clover pastoral areas provided the lime and fertiliser dressings necessary are not too costly to apply.

The essentials for perennial ryegrass-white clover pasture establishment are seed-bed preparation to enable the grass and clover seed to strike, manuring to keep the pasture plants vigorous, and the destruction of competing vegetation through preparatory cultivation or subsequent stocking.

There are three common ways of preparing a seed-bed—burning, surface cultivation, and ploughing. Burning the natural vegetation provides an ash cover for the establishment of seed, and the depth of ash determines to some extent the grass and clover mixture sown: Cocksfoot, for instance, will not germinate in the ash of scrubby 4 or 5ft. manuka, but will do so in the ash from heavy manuka. Burning does not entirely destroy competing vegetation, and bracken fern and manuka are frequently troublesome after surface sowing, requiring a vigorous pasture turf and regulated stocking to control them. However, experience has shown that, even on steep, scrubby, manuka country, provided the moisture-holding capacity of the soil is sufficient, excellent perennial ryegrass-white clover pastures can be established and maintained by topdressing after surface sowing.

The seed-bed prepared by surface cultivation usually gives a better strike of grasses and clovers than is secured after a scrub burn with only a light ash covering, but it does not prevent re-invasion by manuka or bracken. On land so steep that it cannot be rolled surface cultivation usually provides a better seed-bed for germinating clovers than does ploughing; the bed is firmer, and clover seed requires a firm bed in which to germinate. Ploughing and thorough subsequent cultivation leading to a firm, moist, fine seed-bed generally give the best results.

**The land improver should plough all land that can be ploughed, surface cultivate steeper land, and reserve surface sowing for land that can be neither ploughed nor surface cultivated.**

## Irrigation

White clover permanence depends on the rainfall and water-holding capacity of the soil. When a white clover plant germinates it has a taproot, as does a red clover plant, but after 12 or 18 months the taproot dies and the plant depends on shallow roots from its stolons. The plant thus requires a high rainfall and high moisture-holding capacity in the soil for permanence. Soils which are dry in summer will not carry permanent white clover, and on such land subterranean clover may replace white clover.

However, with summer irrigation it is possible to change land of class 7b to class 4 or class 6a, depending on the cost of the irrigation works. The main land of class 7b is comprised of the great shingle fans of the Canterbury Plains, where under natural conditions yields of annual crops are low, white clover is not permanent, and subterranean is the most suitable clover.

Irrigation schemes are established in Central Otago and Canterbury. The Otago schemes reticulate 80,000 acres and the Canterbury schemes are being developed fairly quickly; the Redcliff scheme (5000 acres) and the Levels scheme (13,000 acres) are completed, and the Mayfield-Hinds scheme (82,000 acres) and the Ashburton-Lyndhurst scheme (68,000 acres) are in the course of completion. The Canterbury schemes have not been established sufficiently long to enable an estimation of the final productivity which may be secured through the use of irrigation water on light, shingly land. Pastures of perennial ryegrass and white clover can be established and maintained and annual crop yields increased by the use of irrigation water. Summer irrigation has its most marked effect in increasing pasture production in the January-March period, and the benefits of irrigation (apart from the replacement of rotation with permanent pastures) will be exploited by using this period of grass production to the best advantage, probably through the fattening of store lambs.

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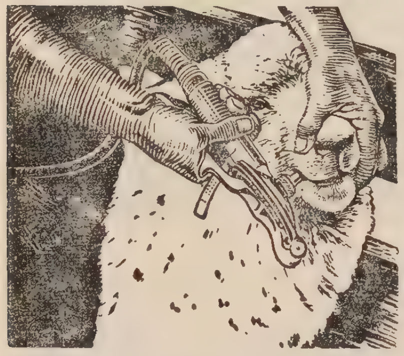

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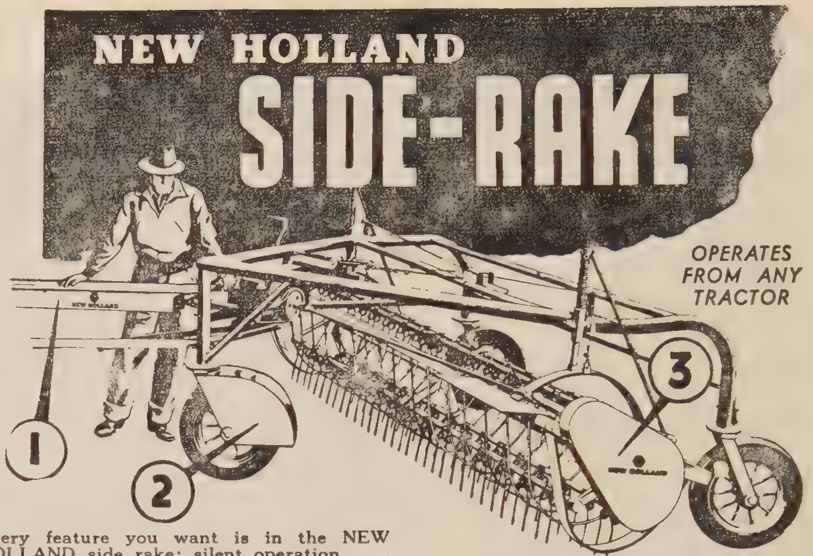

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### CLASS 5: Hilly and Steep Land on which White Clover is Permanent but not Vigorous.

Two main areas are covered by class 5 land—lower tussock country in the South Island where the rainfall is sufficient to maintain white clover but where the fertility is not high enough to allow it to grow vigorously, and the more fertile surface-sown hill country of the North Island.

### Lower Tussock Country

Much of the tussock country in this land class is in a state of transition. Initially it carried a dense cover of tussock, mainly silver tussock (*Poa caespitosa*); between the tussocks existed a wide variety of herbs and grasses. As the result of stocking with sheep and of burning, some of the tussock has died out, to be replaced by mat-forming introduced grasses such as browntop (*Agrostis tenuis*), sweet vernal (*Anthoxanthum odoratum*) and Yorkshire fog (*Holcus lanatus*). White clover (*Trifolium repens*) and suckling clover (*Trifolium dubium*) have also come in and persist. Some of the drier areas contain a number of annual clovers such as striated clover (*Trifolium striatum*) and clustered clover (*Trifolium glomeratum*). On the more fertile areas this association is fairly stable, with a tendency toward an increase in introduced grasses at the expense of the tussocks, which are dying out gradually. On the less fertile areas the association is very unstable, and with hard grazing and burning the stunted clover is unable to assist the grass to any appreciable extent, with the result that the sward may become dominantly browntop with, in some parts, chewings fescue (*Festuca rubra*). This poor sward makes invasion by manuka easy. Consequently much of the one-time tussock country has passed through the stunted clover stage and is now covered with dense manuka.

On hill country where slipping is common subterranean clover is more valuable than white clover because it is able to maintain itself by reseeding.

Hill-country pasture on a damp slope where perennial ryegrass, together with *Poa annua*, Yorkshire fog, and flat weeds, is maintained without being topdressed.

Neither of these types of modified tussock grassland presents much hope of improvement other than by the plough. Topdressing of the areas containing tussock and stunted white clover is not likely to be profitable. The areas that are now covered with manuka are burnt periodically, but to no advantage. Topdressing with phosphatic fertilisers is of little value unless preceded by heavy applications of lime. Some of the easier of such areas are being brought in with the plough, but whether the cost of bringing in the steep country could be balanced by the returns is questionable.

### North Island Surface-sown Hill Country

The second and more extensive area of class 5 land occurs in the Wairarapa, parts of Taranaki, Southern Hawkes Bay, and the upper Rangitikei. After being burnt the land was sown to grass, most mixtures containing ryegrass, crested dogstail, cocksfoot, and white clover. On much of the land in the Taihape district which carries pasture typical of the country in question rainfall and fertility have been suitable for the maintenance of white clover. That is particularly true of some of the loose, sandy soils overlying muddy sandstone and papa. Such country which is extensive is very subject to slip erosion. In some parts there is a covering of volcanic ash which, though more stable than the papa, is very deficient in phosphate. On most of this country white clover persists, sometimes vigorous but frequently in a stunted form. The general plant covering varies with the vigour of the white clover.

On some of the better papa country vigorous white clover is accompanied by healthy ryegrass, sweet vernal, and crested dogstail, with *Poa annua* in the wetter areas and goosegrass in the drier places. Danthonia is also plentiful and growing vigorously, but suffers by competition from the more vigorous grasses and is of little significance except on dry knolls. On this country there is much slipping but, because of the evenly distributed rainfall and high fertility, revegetation is fairly rapid.

Where the country is not quite so good, and particularly where it dries out fairly badly in summer, there is considerably more danthonia and some browntop. Suckling clover is plentiful, but in wet seasons the white clover grows quite well on the shady faces. Where clover is growing satisfactorily weeds such as manuka and fern are virtually absent.

Much of the easy hill country that has been covered with volcanic ash does not carry a good pasture. Both white and suckling clover are present throughout, the white clover being very stunted. The grass association is very variable, but usually consists of mat-forming grasses such as danthonia, chewings fescue, and browntop. Small amounts of dogstail, cocksfoot, and Yorkshire fog are often present. Flat weeds such as catsear are abundant, but in this relatively high-rainfall, fertile country weeds do not present a major problem on efficiently managed pastures. Manuka survives on steep, poor faces, but does not tend to spread as it does on some of the equally or less fertile soils in lower-rainfall districts or on comparatively low-fertility soils in high-rainfall areas. Hard fern is not common and is confined to some steep, dark-lying faces, and bracken fern comes in only on neglected areas.

On much of the country a fairly high proportion of cattle to sheep is carried, the cattle being used largely to clean up roughage left by the sheep.

In recent years much attention has been paid to pasture improvement by the use of phosphatic fertilisers. On the small holdings practically the whole area is topdressed periodically. Hand in hand with the topdressing has gone the surface sowing of clovers, white clover being used to some extent but not nearly as extensively as subterranean clover.

On dry faces subterranean clover when topdressed grows very well indeed and combines well with danthonia, which is the dominant grass. After a few years crested dogstail and ryegrass come in and replace some of the danthonia. Subterranean clover is particularly valuable in colonising slips overlying papa, where there is only a thin covering of topsoil. In winter these are usually very wet and in summer they dry out badly. Under those conditions subterranean clover is proving valuable, as it is able to grow well during the wet winter period and its normal death after seeding coincides with the dry summer spell. Under these alternating wet and dry conditions white clover will not survive.

The ash-covered country responds very readily to phosphatic topdressing, which enables good pasture to be maintained, the quality of the pasture being determined by the amount of phosphate applied, the presence of vigorous clover, and the number of stock that can be carried.

In general, the presence of stunted white clover on hill country indicates either that the fertility is low or that the country dries out too much in summer. Topdressing with phosphatic fertiliser will do much to encourage the white clover on soils where there is sufficient summer moisture. Where the moisture is low subterranean clover is valuable, as it will survive under conditions that are too dry for white clover. For that reason it has been found profitable to autumn sow subterranean clover at 2 to 3lb. per acre on sunny faces and to sow white clover at up to 2lb. per acre on dark faces, provided that in both cases topdressing can be carried out. The introduction of either of these clovers without subsequent topdressing is likely to make little improvement except on the most fertile areas.

## Flock House Trainees Take Active Part in Management of Sheep Flocks

SHEEP work on Flock House Farm of Instruction at certain periods of the year entails a good deal of time and labour. Tuition in sheep management is one of the major subjects of the new curriculum, there being 11 lecture papers on that subject — breeds and types, care of the ewe, dipping, crutching, docking of lambs, foot-rot, care and repair of shearing machines, shearing, shearing shed management, wool, and the main sheep diseases and complaints. These papers are fully discussed at the lecture periods and are given just before any seasonal activity. In all the farm's activities trainees are first taught the fundamentals and principles of the subject, so that when they carry out the work they have a full appreciation of what they are doing and why they are doing it.

The photograph shows part of the preparation of a breeding flock for the season, which entails mouthing, drafting for wool, age, and other factors, determining the constitution of the flocks, dagging, and foot-rotting. Trainees are shown what is required and are engaged in all seasonal operations. Ewes are bred to both Romney and Southdown rams.

—*J. H. HITCHCOCK, Farm Training Supervisor,*
*Flock House Farm of Instruction, Bulls.*

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# New Treatments for Control of Subterranean Grass Caterpillars

THIS article by J. M. Kelsey, J. M. Hoy, and A. D. Lowe, of the Department of Scientific and Industrial Research Entomological Research Sub-station, Ashburton, gives the results of tests over a period of 3 years during which several new treatments for the control of "porina" caterpillars were found to give better results than the standard paris green-bran bait previously used. A brief outline of the life history of the insect is also given.

General view of the 1948 trial area. Right to left—Untreated; treated with 2 per cent. D.D.T.; treated with paris green-bran bait; treated with .5 per cent. BHC.

THE subterranean grass caterpillar is well known to Canterbury farmers as "porina" and it is unfortunate that this name already belongs to another group of animals and so cannot be used for the caterpillar. The correct name of the latter is *Oxycanus*, and at least two species cause major damage in Canterbury.

## Life History

In Canterbury *Oxycanus* moths fly in the evening from late September to November. In 1949 the common species began to fly on October 6 and by the end of that month the flight was practically over. About the end of the third week in November another species commenced to fly at Winchmore, and damage due to this species usually shows up during late July and August, whereas damage by the commoner, early-flying species shows up from late February to May according to when heavy rains fall after mid-February.

The white eggs are laid on the surface of the ground and turn jet black within about 2 hours. After egg hatching, which occurs in about 4 weeks, the young caterpillars spend the first 4 to 6 weeks on the ground surface or within the top ½in. of soil under dense vegetation, weeds, or straw. Survival of the eggs and young caterpillars from the end of October to December depends on a high humidity at the ground surface, so that if pasture is close grazed during this period, the hot, dry conditions in Canterbury will destroy many of the eggs and caterpillars.

Straw left on pastures provides shelter for newly hatched caterpillars and seriously reduces the effect of insecticides.

**Irrigated land, however, provides excellent conditions for survival of both eggs and caterpillars during the critical period, and farmers should keep a close watch from February to May on irrigated paddocks in areas where moths were known to have been flying.**

With the late-flying species, pasture should be examined during July and early August.

During December the caterpillars construct an almost vertical tunnel into the soil to an average depth of about 8in. and cover the top with a light web 2 or 3in. in diameter under which they shelter and feed during the night or in dull weather as food becomes scarce. Farmers should make a practice of examining pasture after heavy rains from February to May, for though it is extremely difficult to secure an accurate estimate of population densities by soil samples when the ground is hard and difficult to break up, after heavy rains it is relatively easy, and damage begins to show up within a week of the rain. The resting stage of development is present from July to time of emergence of moths in October and the pupae are able to move up and down the tunnels, but cannot feed.

## Irrigation and Drowning of Caterpillars

Though there is a fairly general belief among farmers and officers engaged on irrigation works that irrigation will drown *Oxycanus* caterpillars, the writers' experience has been that they are almost entirely unaffected by irrigation. The seagulls that commonly follow water down irrigation borders were found to be feeding on cutworm and army worm caterpillars,

Ground cover on untreated strip, showing amount of natural recovery. Left—At time when treatment was begun on other plots. Right—At time when experiment on other plots concluded.

ground beetles, and other surface-inhabiting insects and spiders, and though *Oxycanus* caterpillars may be seen at the tops of tunnels as waters are receding, sampling showed that, except in depressions where water lay on the surface for 12 or more hours, none had been drowned by the water.

### *Oxycanus* Increasing

A study of past and present damage shows that *Oxycanus* populations are without doubt increasing in intensity, and whereas from 1939 to 1942 10 to 12 caterpillars per square foot was considered a very high concentration and 15 exceptionally high, it has been the writers' experience since 1947 that the average population in many areas is 13 or more, while 20 to 45 per square foot is not at all uncommon. The average population for 130 acres under treatment in 1949 was 13.4 caterpillars per square foot, and the lowest and highest averages for any large area were 6.3 and 23 respectively.

During the past 3 years there have been cases where the standard paris green-bran bait (2lb. of paris green in 25 to 30lb. of bran per acre) gave poor control, and it is considered that this was probably due to caterpillar populations averaging more than 6 per square foot, as current tests showed that with average populations of 7, 10, and 20 per square foot the control by the standard bait was 65 per cent., 60 per cent., and 20 per cent. respectively, and even with 3lb. of paris green and 60 to 70lb. of bran the control was only 40 per cent. in the area where the caterpillar population was 20 per square foot. The 1949 series of experiments made it quite obvious that the 30lb. of bran, and probably the 2lb. of paris green also, is not sufficient to give adequate control of *Oxycanus* populations averaging more than 6 per square foot.

### New Treatments

Over the past 3 years tests were carried out with D.D.T. and benzene hexachloride (BHC, "Gammexane," and 666 are also names for the latter product) as substitutes for the paris green in the bran bait and also incorporated in superphosphate. The inclusion of the last-named was in part due to the difficulty of applying the bran baits by farm implements other than rotary and screw-feed type topdressers, and since farmers do not usually own these types, it meant that the baits had to be applied by contractors in many instances at a per-acre charge of 3s. 8d.

In the treated-superphosphate series of tests carried out in 1949 on 10 acres with an average caterpillar population of 20 per square foot there were the following treatments: Benzene hexachloride superphosphate at 1 per cent. and 0.5 per cent. concentrations of gamma isomer, 1 and 2 per cent. para para isomer D.D.T., all in ¾cwt. superphosphate per acre, and paris green at rates of 2lb. in 50lb. of bran and ¾cwt. of superphosphate and 3lb. in 60 to 70lb. of bran and 1cwt. of superphosphate per acre. In a subsidiary series the same insecticides were used in bran and sawdust; the latter substance gave poor results.

Results showed that there were 5 treatments that gave better control than the standard paris green-bran bait with caterpillar populations averaging 20 per square foot. These, in order of merit, were: 1 per cent. BHC-superphosphate, 0.5 per cent. BHC-superphosphate, BHC-bran, 2 per cent. D.D.T.-superphosphate, and 1 per cent. D.D.T.-superphosphate. Per-acre costs of these, including the ¾cwt. of superphosphate, were 25s. 8d., 15s. 8½d., 7s. 2d., 17s. 9d., and 12s. respectively. The higher application of paris green-bran-superphosphate cost 25s. 9d. and the lower dosage 18s. 8d. per acre. Percentage control given by the above 5 treatments and the 2 paris green-bran-superphosphate dosages was 100, 75, 75, 70, 60, 40, and 20 respectively; on untreated areas it was 0.

The tests established that 6½lb. of 13 per cent. gamma isomer BHC per acre gave better control than any other treatment and that this material was slightly more than four times as effective as equivalent dosages of D.D.T. The 2lb. of paris green and 50lb. of bran plus ¾cwt. of superphosphate was 80 per cent. less effective than 6½lb. of 13 per cent. BHC-superphosphate, 55 per cent. less effective than ¾lb. of BHC-superphosphate or 1lb. of 13 per cent. BHC in 50lb. of bran, 50 per cent. less effective than 2lb. of 95/97 per cent. ppi D.D.T., and 40 per cent. less effective than 1lb. of 95/97 per cent. of ppi D.D.T. per acre. The cost of the 13 per cent. BHC was 3s. per pound, of 95/97 per cent. D.D.T. 6s. 11d., paris green 4s. 2d., and bran 1d.

It should be noted that the baits used contained at least 50lb. of bran instead of the maximum of 30lb. per acre permitted by the Wheat and Flour Controller and that even this amount was insufficient to give adequate caterpillar control.

### Two Groups

It will be seen that the new treatments fall into two groups: Those containing superphosphate, which can be applied by any implements such as drills that normally handle superphosphate and lime, and those containing bran, which makes them difficult to apply except by screw-feed or rotary-type topdressers. For farmers who intend to apply superphosphate the choice would naturally fall on the treated superphosphate for *Oxycanus* control, but if superphosphate has already been applied or it is not intended to apply it, there remains the BHC-bran bait.

Of the 5 treatments that gave better results than the standard paris green-bran bait, that giving consistently best results (for example, 6½lb. of 13 per cent. BHC-superphosphate per acre) is perhaps too costly for general farm use and could be reserved for areas yielding high returns. The next 2 were equal in order of merit (for example, 3¼lb. of 13 per cent. BHC in superphosphate or 1lb. of 13 per cent.

BHC in bran), the costs were satisfactory (for example, 9s. 9d. and 7s. 2d. per acre respectively), and control given was reasonably good. In both respects the two treatments were well ahead of the standard bait. The higher D.D.T.-superphosphate treatment gave a good measure of control, and though the cost was higher than the slightly better lower dosage of BHC, it is possible that the price of D.D.T. will fall to a level that will permit using a dosage that would give the same control at equivalent cost to the BHC.

**Comparison of Old and New Methods.**

To give a fair comparison between the new and older methods of treatment it is necessary to divide farmers into two groups as follows:—

Those who intend to control *Oxycanus* but who do not intend to apply superphosphate.

Those who wish to control *Oxycanus* and who also apply superphosphate.

For those who come within the former category there is the new BHC-bran bait (for example 1lb. of 13 per cent. BHC in 50lb. of bran) and the old paris green-bran bait (for example 2lb. of paris green and 50lb. of bran) at costs per acre of 7s. 2d. and 12s. 6d. respectively. On costs alone the BHC-bran bait is more satisfactory, but when it is noted that the new treatment gave 75 per cent. control against the old bait's 20 per cent. the adoption of BHC in place of paris green in the bait is the logical choice.

Farmers who used paris green-bran baits and also applied superphosphate could not carry out both operations at once, had to go over the same ground twice, and in all probability had to pay contract rates for the bait application. Total costs for the bait and superphosphate were therefore 24s. 5d. per acre if 50lb. of bran was used or 22s. 9d. if 30lb. was applied. The former charge is made up as follows: 8s. 4d. for 2lb. of paris green, 4s. 2d. for 50lb. of bran, 8s. 3d. for 1cwt. of superphosphate, and 3s. 8d. contract acreage application rate. The 15s. 8½d. charge given previously for the 0.5 per cent. dosage of BHC-superphosphate was for an application rate of ¾cwt. of superphosphate per acre, and as 1cwt. per acre is the average rate for Canterbury, the total charge would be 18s. an acre (9s 9d. for the BHC and 8s. 3d. for superphosphate). This is cheaper than the paris green-bran-superphosphate treatment, but to it must be added mixing charges, which would bring the total cost to approximately £1 per cwt. if fertiliser works prepared the material. In 1949 the cost (materials, mixing, and labour) of 30cwt. of the lower BHC-superphosphate mixture prepared by a fertiliser works was £30 8s. 3d. It can be seen, therefore, that the new treatment is not only cheaper, but gives nearly four times the control exercised by the standard paris green-bran bait plus 1cwt. of superphosphate.

**Response to Superphosphate**

It should be pointed out that the treatments were applied in May, and it is not the usual practice for superphosphate to be applied in autumn in Ashburton. Results, however, showed that in the experimental areas there was an excellent response to superphosphate applied in May except in one paddock at Waitohi, near Temuka,

Upper—Pasture cover on area treated with 2 per cent. D.D.T.; untreated area in lower right corner. Middle—Pasture cover on area treated with .5 per cent. BHC. Lower—Pasture cover on area treated with 1 per cent. BHC.

# NEW TREATMENTS FOR GRASS CATERPILLARS

The tall peg in the centre separates the paris green-bran area on left from the untreated area on right. At top right-hand corner is the .5 per cent. B.H.C. strip. Both paris green-bran and untreated strips have approximately 20 per cent. pasture retention.

where there was no evidence that superphosphate stimulated pasture growth. Farmers wishing to inquire further on this subject should consult the appropriate officers of the Department of Agriculture.

**There is one important consideration for all the treatments against *Oxycanus*: Straw should not be left on pasture. It is harmful not only to the pasture below, but acts as shelter for young caterpillars during hot weather and also prevents insecticides from reaching the ground, where they must lie to give optimum control.**

### Advantages of Treated Superphosphate

Though BHC has a strong and objectionable odour, it is not as poisonous to humans or stock as paris green or lead arsenate. D.D.T. has a rather sweet odour that is not unpleasant and for this reason would be preferable to BHC if the dosage could be increased and the present price reduced. Treated superphosphate mixtures have the following advantages over the standard bait:—

1. Reduced toxicity to humans and stock.
2. They can be applied by drills of other standard farm implements handling superphosphate or lime.
3. Reduced total cost if superphosphate is to be applied.
4. More effective control.
5. Rain does not affect them adversely.
6. They are both stomach and contact poisons.
7. The superphosphate stimulates pasture growth.
8. Insect control and topdressing are carried out in the one operation with consequent saving in time and labour.
9. They are effective against caterpillar populations as high as 20 per square foot, whereas 3lb. of paris green and 60 to 70lb. of bran plus 1cwt. of superphosphate failed badly at such high population densities.
10. They retain their effectiveness for a period of at least 18 months—the period of test so far.

In regard to this last point it would be advisable to roll bags occasionally as the treated superphosphate, in common with straight superphosphate, tends to cake if left undisturbed for long periods.

If farmers wish to use BHC in place of the standard bait, there are two procedures open to them:—

1. They can, possibly through Federated Farmers branches, secure the interest of a fertiliser works with a view to having the insecticide incorporated with the superphosphate during mixing.

2. Buy 13 per cent. BHC and mix it with superphosphate or bran as required, preferably in a concrete mixer.

### Mixing

The main objections to farm mixing are that BHC has an unpleasant odour and, as the colour and texture of BHC are the same as those of superphosphate, it is very difficult to be sure that a uniform mix is obtained. D.D.T. is a white powder and its odour is not unpleasant, but it would be difficult to know when a thorough mix of superphosphate and D.D.T had been obtained.

If arrangements cannot be made with a fertiliser works to prepare treated superphosphate and have it available by March 1 at the latest, farmers could secure the 13 per cent. BHC and 95/97 per cent. D.D.T. from the New Zealand distributors. The amounts of insecticide used per acre are 3¼lb. of 13 per cent. for the BHC, and 2½lb. of 95/97 per cent. for the D.D.T., or if the BHC-bran bait is preferred, 1lb. of 13 per cent. BHC per acre. If farmers have a high-return crop and want 100 per cent. control of *Oxycanus* caterpillars, they could apply 6½lb. per acre of BHC or 5lb. of the D.D.T. in the superphosphate.

Some farmers who saw the current and past trials have stated that they intend to apply treated superphosphate as a routine procedure in place of straight superphosphate to ensure that certain pastures will be free of caterpillar damage. On high-return areas and on irrigated land this should prove an admirable procedure if it is known that *Oxycanus* moths are flying in those areas.

### Acknowledgments

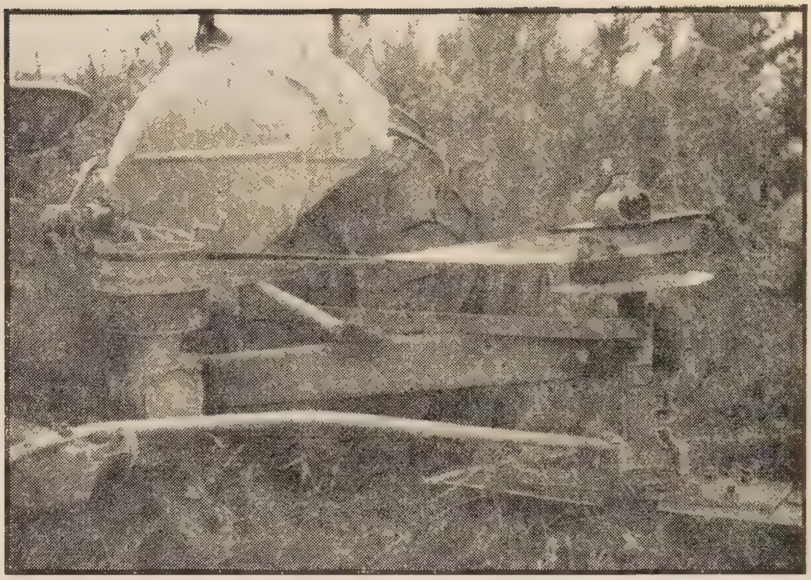
The authors wish to acknowledge the assistance given by farmers who co-operated and gave the use of their farms for experimental purposes and by the firm who supplied the "Gammexane" (BHC) and arranged for the mixing of the D.D.T and BHC with superphosphate. Thanks are also due to officers of the Department of Agriculture, Ashburton, for their co-operation and advice and to Mr. L. J. Dumbleton, of the Entomological Research Station, Nelson, for initiating the work, and for criticism, suggestions, and interest in it.

The central peg marks the boundary between the paris green (2lb.) - bran (50lb.) treated area on right, and paris green (3lb.) - bran (70lb.) area on left.

# GORSE AND SCRUB CUTTER

By D. F. SCOTT, Farm Machinery Instructor, Department of Agriculture, Auckland.

MANY farmers are faced with the problem of clearing gorse and scrub from the land, and though the mower fitted with a scrub bar will deal very effectively with scrub up to the thickness of a man's thumb, a method that can be used with even heavier scrub is employed by Mr. R. W. Lister, of Whitford, near Auckland, who has built out of scrap material a machine which can be fitted to the tractor in a few minutes. Although this machine performs only one of the functions of the much more expensive and complicated gorse cutters common in Canterbury, it appears worthy of note because of its simplicity and effectiveness.



The gorse and scrub cutter mounted on the tractor, showing how the blade is attached and the pipe and angle iron braces.

MOST of the parts are from an old car. The channel iron supporting members are from the chassis and the bearings and shaft which carry the cutter are half of the rear axle and housing. The pulley is mounted on the splined end of the axle which used to fit into the differential, and fixed to the wheel hub is the knife assembly. This is made of 4 pieces of grader blade shoes and, as the steel is so hard, use was made of existing holes to bolt the blades on to the hub with ⅝in. bolts. The belt pulley of the tractor is mounted in the vertical position as shown in the photograph.

Although the arc of the blades does not extend very far beyond the wheel of the tractor and only a narrow strip is cut while going forward, the full width of the knife is effective when reversing along the strip.

Mr. Lister reports that he can cut gorse up to 5 or 6ft. high and blackberry is shaved off close to the ground. Use is made of the tractor's plough-adjusting gear to control the height above the ground of the blades, and if the blades strike the ground because of unevenness of terrain, the assembly lifts slightly and slackens the drive belt so that it slips.

Although the machine fits very conveniently to the type of tractor shown, it could be easily modified to fit other types which have the belt pulley on the side. In this case it would be necessary to mount the cutter in front of the tractor instead of at the rear and to provide another means of raising and lowering the blade. However, the same idea could be used for the blades and their means of support.

As can be seen from the photograph, the main support is from the piece of channel iron, but it is braced at the top by a piece of angle iron and at the bottom by a piece of pipe. The handle which is used to raise and lower the blade is the small crank which can be seen just above the tractor pulley.

Either the machine as shown or one similar, but with minor alterations to suit different tractors, should be of considerable use to farmers who have roadsides or paddocks infested with gorse or light scrub.

View of a roadside where the machine was used. The cutter will handle heavier gorse than that shown here.

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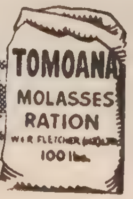
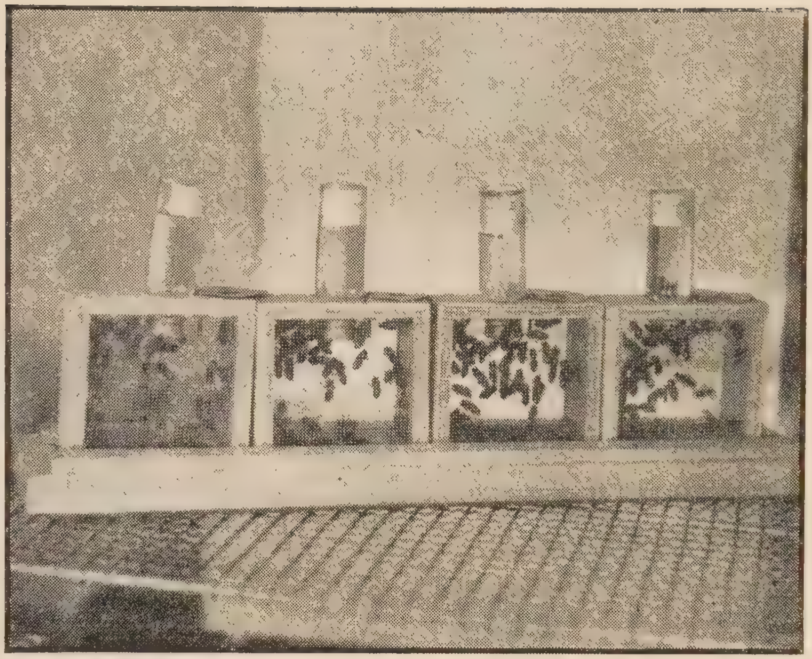


# Chemical Weedkillers and the Beekeeping Industry

By T. PALMER-JONES, Research Officer, Department of Agriculture Animal Research Station, Wallaceville.

**TESTS described in this article show that the use of 2, 4-D and M.C.P. acid preparations as hormone weedkillers constitutes no hazard to the beekeeping industry. However, the plant poison sodium D.N.O.C. is toxic to bees and precautions should be taken to avoid losses in bees if it is used on a large scale.**



Caged bees being fed solutions of hormone weedkillers.

DURING the last few years the increasing use of chemical weedkillers has been a noticeable feature of overseas agriculture. These weedkillers are already employed fairly extensively in New Zealand, and there is no doubt that their use will increase as a wider range becomes available and methods of application become more effective. Chemical weedkillers may be divided into two groups:—

**Hormone weedkillers.**

**Non-hormone-type weedkillers**

## Hormone Weedkillers

Hormone weedkillers are a very recent development and have been used commercially for only a few years. In the August and September 1946, issues of the "Journal" J. P. Hudson described plant hormones, showing how these substances, which are found in the normal growing plant, are necessary for the control of its vital activities. Substances may be prepared artificially which are related to the natural hormones and affect the plant similarly. Hudson gave five uses for these artificially prepared hormones: As fruit-set hormones, fruit-drop hormones, weed-killing hormones, transplanting hormones, and hormones for use in plant propagation. In this article, which deals with the effects that the use of such hormones may have on the beekeeping industry, the weed-killing group alone are considered, as these are the only ones with which bees are likely to come in contact.

At present many commercial preparations of hormone weedkillers are on sale in New Zealand, but all are derived from two main types:—

**2, 4-D acid** (2, 4 dichlorophenoxyacetic acid) base and its compounds (esters, amine salts, and sodium salts).

**M.C.P. acid or methoxone** (2 methyl, 4 chlorophenoxyacetic acid) base.

Hormone weedkillers applied as dusts or sprays to plants usually cause disturbances in their normal growth processes, resulting in death. These weedkillers are selective, some plants being resistant at all stages of growth and others being resistant only at certain stages. The selective action of hormone weedkillers can be used in some instances for obtaining clean crops and pastures when these cannot be cleared economically by hand. In the "Journal" for November, 1948, P. B. Lynch described trials of hormone weedkillers conducted in New Zealand.

### Effect on Bees

The beekeeper is naturally concerned with the question of whether the use of hormone weedkillers will constitute a new threat to the beekeeping industry by causing a heavy mortality in field bees. Research workers overseas have tested the toxicity for honey bees of these weedkillers. Eide (1) in 1947 fed 50 parts per million of 2, 4-D in 10 per cent. sugar solution to bees without causing mortality. Bees in contact with a card on which 2, 4-D had been allowed to dry, giving a concentration of .001 grammes per sq. cm., were also unaffected. Eckert (2) in 1949 stated that 2, 4-D was not very toxic to bees and was used in such small quantities as to have little or no toxic effect.

The development of more efficient spray equipment has enabled hormone weedkillers to be sprayed in much higher concentrations than was possible at first, and sprays containing 2 per cent. of 2, 4-D and M.C.P. acids are now often used on a large scale. It should be noted that the practice is to express the strength of hormone weedkillers as the percentage by weight of pure 2, 4-D or M.C.P. acids present in the solutions or powders used.

The higher concentrations of hormone weedkillers now being used and the lack of detailed knowledge available regarding their possible toxicity to honey bees led to the tests outlined in this article being undertaken.

It is apparent that hormone weedkillers applied as sprays or dusts might come into contact with field bees in the following conditions:—

**Liquid sprays:** Bees could come into contact with these on flowers and foliage before the sprays had dried and might also collect contaminated dew and moisture held on the leaves of plants. Pollen might also be contaminated. Toxicity tests were carried out with the following aims: 1, To find if the liquid hormone solutions acted as contact poisons to bees. This was tested by spraying the hormones in a fine spray over bees. 2, To find if the hormone weedkillers acted as internal poisons to bees. This was tested by feeding various concentrations of the hormones in sugar syrup to bees.

**Dried sprays:** Bees usually would come into contact with the sprays in a dry condition on flowers and foliage. Toxicity tests were carried out to find if the sprays were toxic in this state by confining bees in cages on the gauze sides of which the hormone weedkiller under test had been allowed to dry.

**Dusts:** Hormone weedkillers are sometimes applied by blowers or from aeroplanes as a fine dust, in which form they might come into contact with field bees. The toxicity of such dusts was checked by dusting bees and confining them in observation cages.

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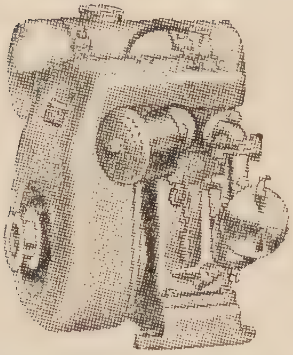

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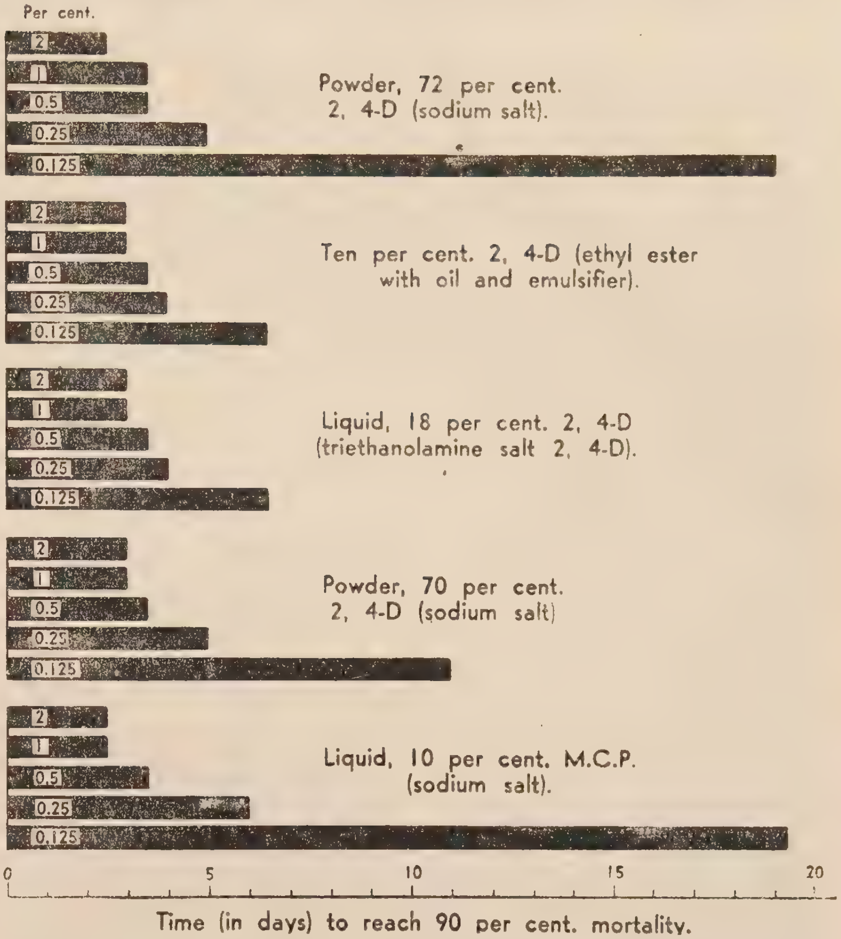


Graph showing the toxic effect on caged bees of hormone weedkillers dissolved in sugar syrup and fed in various strengths (calculated as the acid equivalents).

**Method of Conducting Tests**

Throughout the investigations bees used in toxicity tests were confined in wooden cages of approximately 3in. x 3in. x 1½in. internal measurement fitted with gauze sides (12 mesh per inch). Bees were added or removed from the cages through an aperture at the top which could be closed or reduced in area by a pivoted metal flap. Bees were always fed the solutions under test in 2oz. bottles the screw caps of which were pierced with small holes and inserted through the openings in the cages (see the photograph on page 129). Cages were kept in a dark incubator at 78 degrees F. They were supported for convenience of handling in wooden racks. All tests except the second series listed in Table 2 were conducted in duplicate, each of the cages used being filled with 50 young bees removed from the brood combs of hives in the laboratory apiary. The average of the two results obtained is given later in this article. The most convenient method of transferring bees to the cages was to shake them from the combs into a container, where they were anaesthetised with carbon dioxide. They could then be counted direct into the cages, if the toxicity of hormone solutions was being tested, or sprayed or dusted before being placed in the cages. The sugar syrup used in the tests contained 34.2 per cent. of cane sugar and was sterilised by filtration. The feeding bottles and caps were also sterilised. Sterilisation was done to prevent the growth of moulds in the feeders.

**Liquid Sprays**

**Effect as contact poisons:** The object of this experiment was to test the effect on bees of fine sprays of hormone weedkillers. The weedkillers were sprayed liberally over 100 anaesthetised bees spread out on a dish, an atomiser being used to deliver the spray in small droplets. After spraying, the bees were caged and fed sugar syrup while under observation. The results of this experiment are shown in Table 1.

Less than 50 per cent. of bees sprayed by the three weedkillers tested died over the 8-day period. Even if no allowance is made for the normal mortality of bees similarly caged, which may reach 8 per cent., it will be seen that the toxicity is very low. Under field conditions bees would be most unlikely to be sprayed as thoroughly as they were in the tests. It thus appears that losses of bees through contact with these weedkillers in the form of sprays would be negligible.

**Effect as internal poisons:** This experiment was designed to find if hormone weedkillers acted as internal poisons for bees. Various strengths of the hormone weedkillers, calculated as the acid equivalent, were fed in sugar syrup to bees confined in cages. These concentrations were prepared by diluting the weedkillers, if already in solution, with sugar syrup or dissolving the appropriate weights of the powdered weedkillers in syrup. The solutions fed were always present in excess, so that the bees were unrestricted in their feeding. The end point was taken to be when 90 per cent. of the 50 bees in a cage had died. This was considered a necessary convention because it was often found that a few bees would live on for days after most had died. The graph on this page shows the results obtained.

Five control cages with 50 bees in each were fed untreated sugar syrup. The average mortality was 4 bees per cage (8 per cent.) during a period of 8 days.

In considering the results shown in the graph it is apparent that there is little difference in toxicity between the sodium salt preparations of 2, 4-D and the others for concentrations as low as 0.25 per cent. In 0.125 per cent. strengths, however, the sodium salt preparations were less toxic. The sodium salt preparation of M.C.P. acid is of even lower toxicity than the others in a 0.125 per cent. solution. It was also noted that caged bees consumed slightly larger volumes of the sodium salt solutions compared with the two other 2, 4-D preparations before 90 per cent. mortality occurred.

**TABLE 1—EFFECT OF HORMONE WEEDKILLERS SPRAYED OVER BEES**

| Type of Spray | Number of bees dead in cages after 8 days |
|---|---|
| 18 per cent. 2, 4-D (solution of the amine) | 19, 18 (average 37 per cent.) |
| 10 per cent. 2, 4-D (ethyl ester solution, oil base) | 36, 9 (average 45 per cent) |
| 10 per cent. M.C.P. (sodium salt solution) | 22, 20 (average 42 per cent.) |

Although hormone weedkillers may sometimes be sprayed in concentrations as high as 2 per cent., water collecting bees would be expected to consume them diluted well below 0.125 per cent. strength. It is apparent from the tests that toxicity is low at 0.125 per cent. strength as bees can consume this dilution for days without a high mortality occurring. Therefore spraying operations are not likely to cause noticeable bee mortality.

A common way of estimating toxicity is to state the treatment required to produce a 50 per cent. mortality. Viewed in this way the substances tested gave the following figures, which represent the time required for the 0.125 per cent. acid-equivalent solutions to cause a 50 per cent. mortality in the bees fed:—

| | Days |
|---|---|
| Sodium salt of M.C.P. acid .. | 9 |
| Sodium salt of 2, 4-D acid (a) | 8 |
| Sodium salt of 2, 4-D acid (b) | 7½ |
| Amine salt of 2, 4-D .. .. | 4½ |
| Ethyl ester of 2, 4-D (oil base) | 4 |

**Dried Sprays**

The contact effect of dried sprays on bees was tested by soaking the usual 12 mesh 3in. square wire gauzes

# WEEDKILLERS AND THE BEEKEEPING INDUSTRY . . .

in various hormone sprays and allowing them to dry. The gauzes were then used to form the sides of cages in which bees were confined. Deaths of bees over an 8-day period were noted. In the first experiment gauzes were used immediately they dried, in the second they were used 8 days after drying. The results are shown in Table 2. From the table it is apparent that except for the oil-base weedkiller the materials had little toxic effect on bees. Though the other weedkillers dried rapidly, the oil-base preparation remained oily for days on the gauze and its toxic effect was apparently largely due to the oil soaking the bees. However, when the gauze was thoroughly dry the oil-base weedkiller was no more toxic than the others.

As the tests were carried out under conditions much more drastic than any likely to be met with by bees in the field, it does not appear that the weedkillers in the dry state are likely to cause more than negligible losses of bees.

### Dusts

The effect of hormone weedkiller dusts on bees was tested by dusting them over bees anaesthetised with carbon dioxide. Each dust was applied liberally to the bees (100), which were then caged and supplied with sugar syrup. Control bees were dusted with calcium carbonate. Mortality of bees over an 8-day period was noted (see Table 3.)

Mortality of bees was low, and as the dust had been applied much more liberally to the bees than would occur in field dusting operations, bees would not be depleted by these weedkillers applied as dusts.

If the toxicity of the 2, 4-D, and M.C.P. weedkillers for honey bees is compared with that of D.D.T. and arsenic, both of which are used on a large scale as insecticides, it will be seen that their toxicity is relatively much lower. Thus 0.00005 milligrams per bee of arsenic internally is lethal and a concentration of 0.05 per cent. D.D.T. acts as an internal poison for bees, most of them dying in 17 to 42 hours when feeding on it. Most bees die in 6 hours if kept in cages sprayed with 0.05 per cent. D.D.T. Bees can be fed in cages with 0.125 per cent. strengths of 2, 4-D and M.C.P. acids for days before a 50 per cent. mortality occurs, and these substances have little effect on bees as contact poisons and dusts.

It should also be remembered that the new weedkillers, unlike insecticides, are used to destroy plants, and although this may take a considerable time, flowers are the most sensitive parts of plants and may be affected sufficiently within a few days to close. Thus it has been reported that dandelions sprayed with 2, 4-D showed no blossoms after 24 hours. It would appear probable that shortly after spraying no flowers would be open to attract bees, which would visit sprayed plants solely to collect water trapped on the leaves. It should also be possible to avoid spraying at times when flowers present in the area to be sprayed would be likely to attract bees. Large-scale spraying operations should always be undertaken if possible in collaboration with the local Apiary Instructor.

**If reasonable precautions are observed, there appears no likelihood that the 2, 4-D and M.C.P. acid preparations in use as weedkillers will constitute a hazard to beekeepers.**

## Non-hormone-type Weedkillers

Many of the non-hormone-type weedkillers, such as the arsenicals, sodium chlorate, sulphuric acid, and oil and tar compounds, have been in use for a long period, and if they are applied with care, constitute little or no hazard to the beekeeper. The use of arsenicals as plant poisons should not be confused with their application as insecticides when they may, if applied without taking suitable precautions, cause severe losses of honey bees, such as occurred recently in the Hawkes Bay area when fruit trees were sprayed with lead arsenate at a time when the blossoms were attractive to bees.

Recently organic materials have been developed of particular value for destroying weeds in peas and onions (which are susceptible to hormone weedkillers) and for the control of certain weeds resistant to hormone weedkillers. A member of this group at present being used in New Zealand is sodium dinitro - orthocresylate (D.N.O.C.). Most preparations marketed in New Zealand contain the sodium salt of D.N.O.C. in solution.

**TABLE 2—EFFECT OF DRIED HORMONE WEEDKILLERS ON BEES**

| Type of spray | Number of bees dead in cages after 8 days' exposure to freshly dried gauzes | Number of bees dead in cages after 8 days' exposure to gauzes dried 8 days previously |
|---|---|---|
| 18 per cent. 2, 4-D (solution of the amine) | 17, 6 (average 23 per cent.) | 25 (50 per cent.) |
| 10 per cent. 2, 4-D (ethyl ester solution, oil base) | *45, *50 (average 95 per cent.) | 11 (22 per cent.) |
| 70 per cent. 2, 4-D (saturated solution of sodium salt) | 11, 1 (average 12 per cent.) | 14 (28 per cent.) |
| 10 per cent. M.C.P. (sodium salt solution) | 12, 2 (average 14 per cent.) | 13 (26 per cent.) |
| Controls (gauzes untreated) | 11, 6 (average 17 per cent.) | |

* Three days' exposure.

**TABLE 3—EFFECT OF HORMONE WEEDKILLER DUSTS ON BEES**

| Type of dust | Number of bees dead in cages after 8 days |
|---|---|
| 2, 4-D acid powder (100 per cent. 2, 4-D) | 5, 5 (average 10 per cent.) |
| Sodium salt 2, 4-D (72 per cent. 2, 4-D) | 15, 14 (average 29 per cent.) |
| Sodium salt 2, 4-D (70 per cent. 2, 4-D) | 16, 5 (average 21 per cent.) |
| Controls (calcium carbonate) | 5, 3 (average 8 per cent.) |

### Toxicity Tests of the Sodium Salt of D.N.O.C.

**Effect of liquid spray as a contact poison:** A 1 per cent solution of the sodium salt of D.N.O.C. was sprayed liberally with an atomiser over 100 anaesthetised bees spread out on a tray. These bees were then caged and fed sugar syrup. Within an hour of spraying bees began to die, and all were dead within 16 hours.

This was an extreme test and bees are unlikely under field conditions to be sprayed directly with a spray except in negligible numbers.

**Effect of liquid spray as an internal poison:** Various strengths of the sodium salt of D.N.O.C. were fed to bees in cages, employing the usual method. It was found that a 0.01 per cent. solution of the sodium salt in sugar syrup when consumed by bees caused a 100 per cent. mortality in 3 days. This salt is about 200 times as toxic as the 2, 4-D and M.C.P. preparations when given to bees in this way, as a 2 per cent. solution of these causes 100 per cent. mortality in 3 days (see the graph on page 131).

**Effect of dried spray:** The contact effect on bees was tested in the usual way by soaking wire gauzes in a 1 per cent. solution of the sodium salt, allowing them to dry, and then using them to form the sides of cages in which bees were confined for 8 days. At the end of this period the average mortality was 72 per cent. Within the first day of exposure approximately 50 per cent. of the bees succumbed, showing that the dried spray quickly loses toxicity.

**The liquid spray might under certain conditions be collected by field bees carrying water or visiting flowers for nectar. As its toxicity is high, it might cause losses. Care should therefore be exercised if large-scale spraying is undertaken to avoid spraying crops attractive to bees, and advice should be sought from the local Apiary Instructor.**

### References

1. Eide, P. M. (1947): Journal of Economic Entomology, Vol. 40, No. 1.

2. Eckert, J. E. (1949): American Bee Journal, May, page 244.

## Pig Broadcasts

UNDER the auspices of District Pig Councils broadcasts will be delivered in March as follows:—

Auckland—1YA, on March 2, at 12.35 p.m., "The Boar: His Care and Selection," by A. F. Barwell, Supervisor, Bay of Plenty District Pig Council.

Wellington—2YA, on March 21, at 12.35 p.m., "The Carcass Quality Scheme," by C. M. Bailey, Supervisor, Taranaki District Pig Council.

### SUBSCRIPTION RENEWALS

Renewals of subscriptions to the "New Zealand Journal of Agriculture" should be paid to the nearest office of the Department of Agriculture. Subscribers can ensure continuity of delivery by paying their subscriptions as soon as possible after receiving their renewal notices and at least one month before the old subscription expires. When payment is made the renewal notice should accompany the subscription to ensure that the correct details are recorded.

# THE HISTORY AND EVOLUTION OF SHEEP BREEDS

## 3. Developments in New Zealand

By I. S. MILLER, Sheep and Wool Instructor,
Department of Agriculture, Christchurch.

THE history of sheep breeding in New Zealand has never been written and, unfortunately, the material available for the would-be historian is meagre and disjointed, for the pioneer breeders have gone, leaving few records of the part they played in founding the greatest of the country's industries. Like New Zealand, Australia—or, rather, New South Wales—was originally a base for whalers which were scouring the South Pacific, and the earliest introduction of stock was made with the intention of providing fresh meat. Australia's first sheep were of Bengal or Dutch origin, brought by Governor Phillip from the Cape of Good Hope in 1788 for this purpose.

THE problem of utilising the resources of Australia had been considered by British subjects before 1800. In 1798 Sir Joseph Banks, associate of Captain Cook, had urged its exploration, saying it was inconceivable that "such a country, situate in a most fruitful climate, should not produce some native raw material of importance to a manufacturing country as England is."

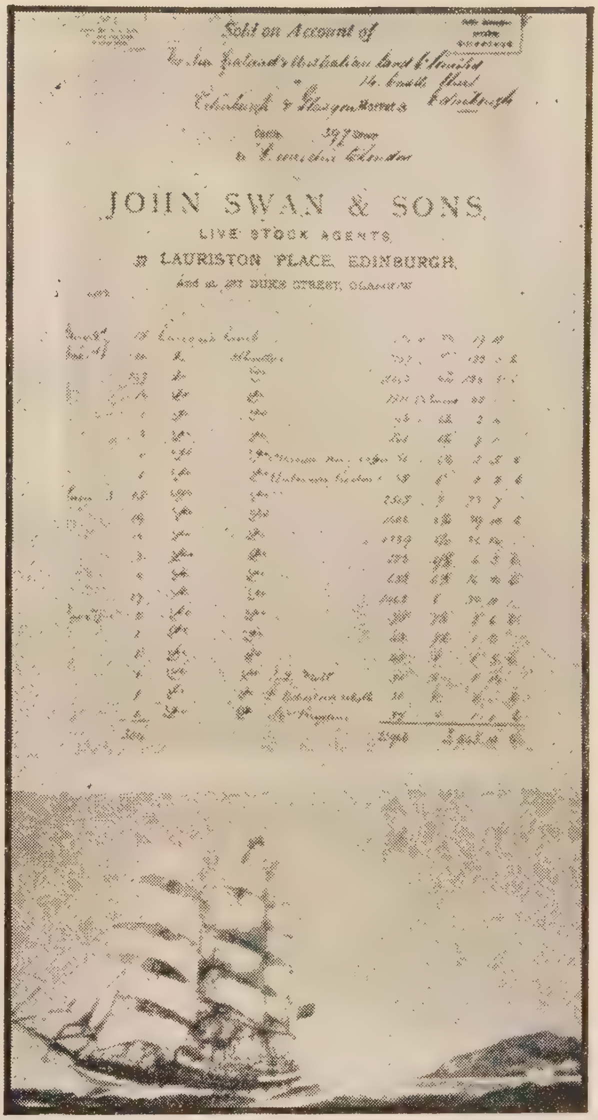
Captain Waterhouse was mainly responsible for the first introduction of Merinos, though he did not realise the significance of his purchase, as he was bent on obtaining sheep for the mutton-hungry colony. In 1789 as agent for the colonial authorities he bought 32 Spanish Merinos at the Cape of Good Hope, and 29 of these reached Australia safely.

Captain John Macarthur in 1794 had first begun dreaming of the wool-growing possibilities of Australia and New Zealand and had experimented in crossing a young Irish ram with some Bengal ewes. "By crossing the two breeds," he told Commissioner Bigge in 1820, "I had the satisfaction to see the lambs of the Indian ewes bear a mingled fleece of hair and wool. This circumstance originated the idea of producing fine wool in New South Wales." Behind Macarthur's experiment lay the unexploited acres and the cheap convict labour of New South Wales. He was aware also of the empty ships which brought out up to 200 convicts and supplies at a time and then had to go on to China to find a return cargo.

### Beginning of Breeding for Wool

Though Macarthur managed to retain only 1 of 44 sheep brought out to Australia at that time by the First Fleet (the rest being worried by dingoes or stolen and slaughtered by convicts), through Captain Waterhouse, of the ship Reliance, a start was made. In 1797 4 or 5 Merino ewes and 3 Merino rams were obtained from the flock of Colonel Gordon, a Scot in the service of the Dutch at the Cape of Good Hope. In 1805 the first Australian Merino stud added 5 rams and a ewe from the Royal Stud of King George III at Kew, and the colony of New South Wales could be said to have started breeding for wool.

Sent home under arrest for disputing the authority of the Governor, Macarthur sought in England not only stud sheep but also a market for his wool. At this time a committee of the House or Commons was debating whether the manufacture of woollen cloth should be freed at last from its traditional restrictions, or whether, because of a shortage of raw material, it was incapable of expansion. Macarthur, supported by Waterhouse, submitted written evidence of the fact that sheep could graze on the natural pastures of the colony and that the samples of fine wool which he produced could become the basis of a supply which would overwhelm the 9,000,000lb. then coming from Spain. Macarthur succeeded in gaining a grant of land and a recommendation that the convicts be fed on mutton instead of salt meat.



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[*From "Great Farmers," by Scott Watson and May Elliot Hobbs.*
The beginnings of New Zealand's frozen meat industry. Upper—Part of a sale note for the first shipment. Lower—The sailing ship Dunedin (1200 tons, Captain Whitson) clearing Otago Heads in February, 1882, with 4919 carcasses of frozen mutton and lamb.

### Answer to German Competition

The rise of the Australian and New Zealand wool industry is described sometimes as though it were largely an accidental development. That is very far from the truth. The fine Merino wool, first of Australia and then of New Zealand, came as the answer to competition from German wools, which by the 1820's the English grower was quite unable to face. During the wars with Napoleon —that is, up to about 1815—British growers had relied on a sheep which gave a good carcass weight and, therefore, with a few exceptions, had ignored the significant transfer of Spanish Merino sheep to Saxony and France. By 1820 it was clear that the British sheep breeds no longer could

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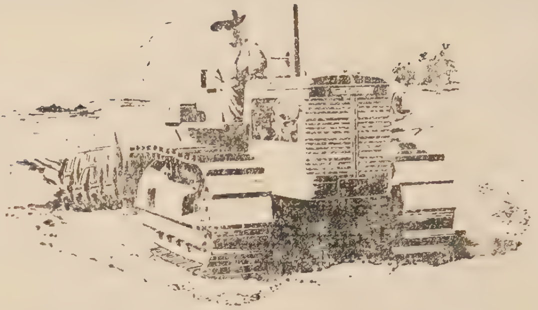

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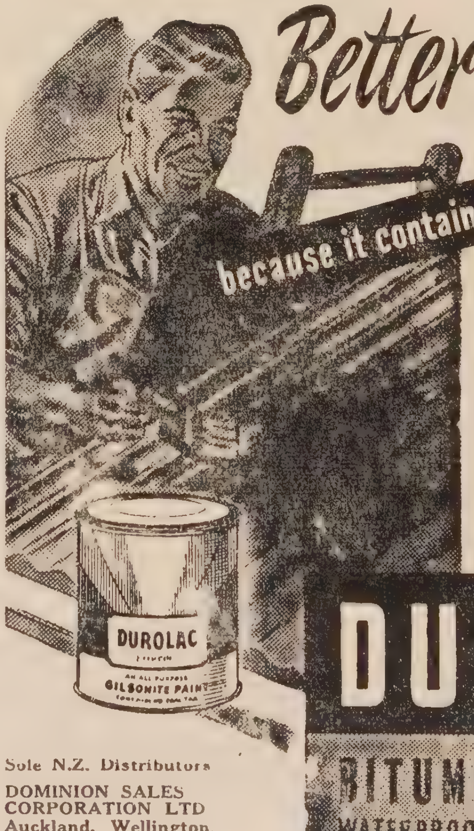

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be the chief source of supply for the raw wools essential to the British clothing industry. The traditional export industry of England was itself in jeopardy and obliged to use the foreign-grown fine wools to maintain its markets. "The gorsy Downs and the bleaker Cheviot regions suffered alike. . . . Lincolns and Leicesters, South Downs and English Merinos, all swept down."

A select committee of the House of Lords was set up in 1828 "to report on the cause of the depression in wool values, with special reference to the probable increase of colonial production." McArthur had sent a solitary bale of his fine wool by the Dart from Sydney in 1807. When the Lords committee sat to hear evidence on the possibility of a colonial wool trade, merchants were testifying: "I have no hesitation in pronouncing that they (the Australian types) are decidedly preferred to the apparently similar descriptions of German wool." The prospect loomed that in the course of a few years Australia could make England independent of Spain and Germany for fine wools.

**Australia was exporting more than 10,000,000lb. a year by 1839, when her economic partner had hardly begun. The beginning of the New Zealand wool trade was really a continuation of the already phenomenal growth in Australia.**

## New Zealand's First Sheep

Almost complete obscurity surrounds the story of the arrival of the first New Zealand sheep flocks and the early export of wool from the country.

Captain Cook can be regarded as the first importer of sheep to New Zealand. On his second voyage he landed a ram and a ewe, out of 2 rams and 4 ewes shipped in May, 1773, from the Cape of Good Hope, in Queen Charlotte Sound. Whether they died from tutu poisoning or not, they certainly did not survive.

Nearly 50 years later Samuel Marsden brought a few Merinos from New South Wales to the Bay of Islands, but there is no record of their survival. However, he continued to take an active interest in the pastoral industry of New Zealand, as well as of New South Wales. Here is a tribute to his memory in a letter from Richard Davis, resident missionary at Waimate, North Auckland, on the death of Marsden: "His last act for us was to provide stock for us when we were in the colony. . . . This he did in a way I shall not soon forget. We have his best breed of cows, sheep, and horses and I value it much." Davis goes on to say: "When I parted from him . . . he said, 'Now, Mr. Davis, should you but arrive in New Zealand safe with your valuable cargo, it will be the making of the country.' We arrived safe, and I can say, as it respects the breed of stock, never did a new country possess at its commencement so valuable a collection." (From "Letters and Journals of Samuel Marsden.") Davis, in a list supplied to the House of Lords in 1838, is described as a catechist and farmer—the only one of the new colony so described.

It was in 1832 that sheep became established in New Zealand, when John Bell Wright brought 102 Merinos from Sydney and landed them on Mana Island, off the west coast of the North Island. Wool was sent to Sydney, both from Wright's flock and from missionary farms in North Auckland, by 1838—possibly earlier.

The foundation flock of John Bell Wright on Mana Island is better known than a smaller flock established about the same time by Kemp or King, or both, Church of England missionaries in the Bay of Islands in the 1850's. The Rev. J. D. Lang, of New South Wales, in the second of four letters addressed to the Earl of Durham in 1839, states as proof of the "extraordinary capabilities of the country, that Kemp and/or King—one a missionary blacksmith and the other a missionary shoe maker—has lately forwarded to Sydney from his estate in New Zealand towards the northen extremity of the (North) Island his first investment of New Zealand wool. amounting to ten bales (containing probably 250lb. each), which from its superior quality, as well as from the superior style in which it had been got up, in consequence of the abundance of fresh water in the island, was sold by public auction in Sydney, for exportation to London, at 1s. 10½d. per lb., or about £234 17s. 6d. altogether."

The Rev. Samuel Marsden, who took an active interest in early sheep farming in both New South Wales and New Zealand.

## Development after 1840

The reason for the land of New Zealand not being used for sheep farming to any extent before 1840 seems to have been partly political and partly economic. Before 1840 it was by no means certain that the British Government was going to take over New Zealand, and until effective Government was established the risks of sheep farming and the difficulties of obtaining a satisfactory title to land were almost overwhelming. Furthermore, the inland of New Zealand was little known and thought to consist mostly of dense bush.

Sir George Clifford has told how his father, originally a railway engineer, was induced to come to New Zealand, where he explored the Rimutaka Range into the Wairarapa, later bought land there, and then journeyed to Australia to buy sheep. He was joined in this venture by his cousin, F. Weld. Troubles with the Maoris caused him to look elsewhere and, overhearing some whalers in a tavern discussing an area in the South Island, he made a visit there and later established his flock at Flaxbourne, other sheep being imported from New South Wales. This in 1847 is claimed to be the first considerable establishment of pastoral farming in the South Island.

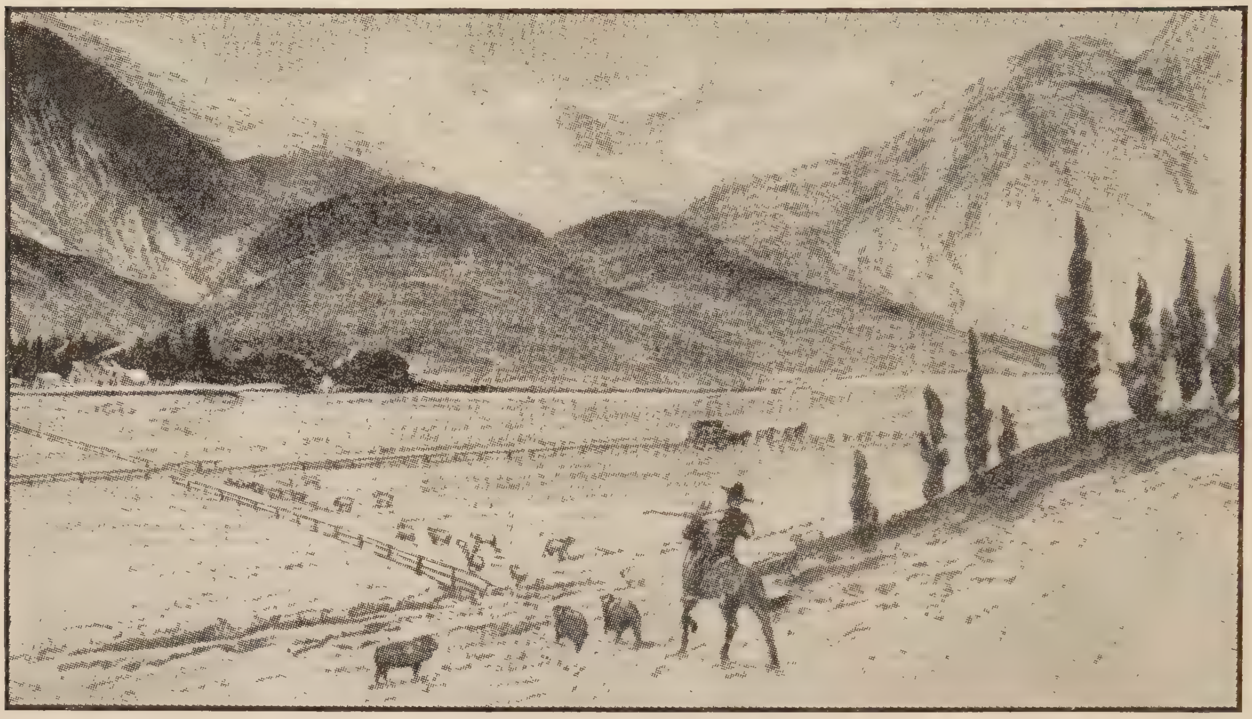
About the same time as Clifford, Weld, and Vavasour were penetrating the Wairarapa, Charles Robert Bidwell, who had sailed from England in 1840 and stayed on a cattle station in Australia for some 3 years, arrived in March, 1843, with sheep bought in Australia. After a year's delay in negotiating for land, he drove his flock of some 350 Merino ewes to the Wairarapa. He met the sheep of Clifford, Weld, and Vavasour on the way.

## Influx of Sheep Begins

From that time onward it is clear that the influx of sheep began, and early newspaper files in every province record the arrival of sheep from New South Wales. How eager the Australian squatters were to find a market for surplus sheep is shown by a letter of May 29, 1851, in the letter book of the Union Bank of Australia, Portland Branch, to the manager in Melbourne: "As you have visited the New Canterbury settlement I have been requested by several settlers here to ask your opinion whether you consider it a good outlet for the rapidly increasing flocks in the district warranted free from catarrh; reports state that there is sufficient grazing land for 6,000,000 sheep and several are thinking seriously of shipping large quantities of sheep if they could get authentic informations respecting its capabilities and the terms on which land is held."

Typical of the newspaper reports of the time is this extract from the "Lyttelton Times" of September 20, 1851: "The importations of stock have been resumed. We learn from competent authority that the sheep imported in the Wellington by W. Kaye, Esq., of Port Phillip (Australia), are of a very superior description, having been selected with such judgment as to render them unrivalled amongst the flocks hitherto brought to this settlement." In a number of cases the Australian squatter followed the sheep, seeking a climate free from the droughts which they had already experienced in New South Wales.

By the late 1850's New Zealand sheep farmers were vying with their



[*From "Making New Zealand" (Department of Internal Affairs).*

"Swyncombe," Kaikoura, was one of the early sheep runs of Marlborough.

Australian competitors to establish the best flocks of sheep, and there seems to have been very close contact between leading breeders in both countries. Typical of such men were George Rich and his son, F. D. Rich.

### Pastoralists' Problems

Wool was still the only agricultural export of importance, for in 1847 Nelson exported £80 worth of butter and £1878 worth of wool. Pastoral farming had some standing as a business, while the arable farmers were still fumbling with the different New Zealand conditions. Pastoralists had no worries about machinery or implements and they had invested their capital in stock, which was better security than land, though there was competition from the older colonies in Australia. They had their problems, too. Maori dogs were troublesome and "sheep scab" struck in Nelson in 1845 and in the Wairarapa in 1846. They attacked this disease by using tobacco water and spirits of tar as a dip, but it spread and was a scourge to many settlements of the colony for 30 years. Runs were not enclosed, so much depended on the skill of the shepherds, many of whom were Scottish, "as highland as heather . . . the dogs being worthy of their masters." W. S. Davidson, of the New Zealand and Australian Land Company, writing of a later period, says: "The Levels was a difficult run to muster, owing to there being much broken country with sharp, deep gullies, very dangerous for smothering wild Merino sheep, which when in large numbers often carried blindly on when on the run. I remember a neighbour once lost about 1500 sheep in as many minutes in a gully, as there was no shepherd at the proper moment to check them. Seeing that they were worth about 20s. per head, it was a heavy loss." He also records a strike over cold mutton shoulder versus hot chops; the employees threatened to leave and gave a month's notice.

Earlier still, large numbers of sheep had to be swum across the rivers, particularly in Canterbury; 60,000 are believed to have been swum across the Waitaki in one year, 1861-62.

### Attempts to Improve Flocks

The first Merinos came from New South Wales. Importations were made to improve the quality of the flocks descended from sheep imported from New South Wales—at first even from Saxony. Tasmanian blood appears to have been popular later, while owners in North Canterbury, Marlborough, and Hawkes Bay used South Australian sheep.

Following are extracts from a letter printed by E. G. Wakefield in 1848 and said to have been written to him by one of the leading colonists in the Nelson district on October 22, 1847:—

"I purchased my sheep in April, 1844, from Sir John Jamieson of New South Wales, whose sheep were celebrated for the purity of their Merino blood, he having bred from the Spanish Merino, without any admixture for 13 years, except a cross with some rams from the Empress Josephine's flock (Negrette origin). I brought down from Sydney thoroughbred Merino rams, and some with a cross of Southdown. I find a cross with the latter, though it of course alters the character of the wool, gives additional size, disposition to fatten, and weight of fleece, whilst the mothers are better nurses, particularly in cold weather, and have a tendency to produce more twins than the pure Merino. Although the wool is not so fine, the greater weight more than makes up for any loss on that head, as from the greater hardihood they are more adapted for the colder, hilly runs; they are, I think, to be preferred with, say, one-fourth Southdown, three - fourths Merino blood, to the throughbred Merino. In warmer localities near the sea coast, I believe the others, however (the Merino), to be the most profitable sheep. . . .

"One general rule must be borne in mind—that you must get a very considerable increase of price per lb. for fine wool to compensate for the loss of weight of fleece and of mutton and for the want of the more prolific and hardy constitution of the half-bred.

"As to the Leicester cross, I must strongly condemn it; the wool is of the worst quality, not to be improved for many generations, whilst the sheep, although doing well enough where they have great abundance of food, are not generally adapted to the wild runs of this country, and the ewes are not such good nurses as those with Southdown blood. A large breeder at Port Phillip, who has for many years bred from Leicester rams, has now quite given them up and lately wrote that he would as soon see a mad dog in his flocks as a Leicester ram. Up to the present time Mr. ——'s sheep and cattle ran with mine, but, the run being now overstocked, his share is to start for the Wairau in a few weeks.

"We have had a capital lambing season in the one just over. . . . Myself have had 123 per cent. of lambs, all doing well."

On the subject of what sheep to buy for importation he wrote: "Take thoroughbred rams and ewes of sorts famous for their fleece. Remember always that, excepting the insurance, it costs no more to take out a valuable than a comparatively worthless ram. Count Gersdorff is the owner of a flock of Merino sheep. . . ."

This letter shows that early breeders were thinking of trying British sheep for cross-breeding. It typifies, too, the stage of experimentation going on while breeders were exploring avenues of importation in Australia and on the Continent for Merino blood.

The Deans brothers had left the Wellington settlement and decided to try their fortune in Canterbury. In 1847 John Deans imported Merinos from Newcastle, landing them at Port Cooper, 430 of those bought surviving.

In Otago an interesting personality, John Jones, an Australian whaler-merchant who was familiar with the New Zealand coasts, established a considerable settlement near Waikouaiti in 1840. Tucker, a surveyor, reporting in 1844, stated that Jones had 100 horses, 200 cattle, and 2000 sheep, so that when the colonists arrived in 1848 Jones was able to supply them with fresh provisions.

## Grigg of Longbeach

The enterprising John Grigg, afterward of Longbeach, landed in Auckland in 1855, and among his other ventures he was an importer and breeder of British long-woolled sheep. This is borne out by an advertisement in the "Nelson Examiner" for October 26, 1865—a notice of instructions received by the firm of Alfred Buckland, Auckland, to sell on Grigg's behalf Leicester and long-woolled sheep on his leaving the province for Canterbury.

In a recently published work, "Grigg of Longbeach," P. G. Stevens, Lecturer in Animal Husbandry, Canterbury Agricultural College, states that the "long-woolled sheep" must have been Lincolns, because Grigg among his introductions had imported from one Kirkham, who was a well-known Lincoln breeder in England. Grigg was thus an accomplished stud master at Otahuhu before he shifted to Longbeach. Particularly was that the case with his English Leicester stud, as evidenced by his success at agricultural shows in Auckland.

## The Riches, Father and Son

A man who does not receive much publicity and yet who must have been one of the early leaders in importing and breeding Merinos for New Zealand conditions was George Rich, who first owned "the celebrated Mount Eden Flock," Auckland. Rich had farmed in Somerset for 40 years and was esteemed "as a man and . . . for his persevering and successful endeavours to improve the breed of sheep in the County of Somerset" when he left England for Australia in 1839. It is not clear how long he was in Australia, but about 1851 he "obtained the pick of 450 ewes from the flock of that celebrated breeder, Mr. John Aitken, of Mount Aitken, Victoria, who had previously (in one year) imported about £3000 worth of sheep from Germany."

*[From "Merino Sheep" (1868).*

Sheep of the Merino stud of F. D. Rich, whose dispersal sale took place at "Bushy Park," Shag Valley, Otago, on March 11, 1868. Upper—Some of the 2-tooth rams. Lower—Part of a lot of 1500 2-, 4-, 6-, and 8-tooth ewes.

After establishing his flock at Mount Eden Rich travelled on the Continent, visiting the principal flocks, and bought at considerable cost over 100 ewes and rams, which "with the greatest possible care and attention on the part of Mr. Rich" were shipped to New Zealand. The progeny of these and his Australian introductions formed Mount Eden flock.

Rich was a leading breeder in the colony, first in Auckland and later in the South Island, and also appears to have made a practice of sending Merinos to Sydney and Melbourne for sale, as well as distributing Merinos in New Zealand. The last consignment of sheep disposed of in Melbourne was shipped by his son, F. D. Rich. The "Argus" reported on December 31, 1862, the purchase of one of his rams by a Mr. Moffatt for the satisfactory sum of £300 cash. The standing of the Riches was acknowledged in Australia.

Rich carried on in partnership with his son, but in 1861 this was dissolved and the flock divided equally between them. The elder Rich took his share to Canterbury with the exception of a small draft disposed of in Auckland, while the son's share was taken to Moeraki, in Otago. In November, 1861, Miles and Co., under instruction from G. Rich, auctioned his flock at Christchurch. Names such as Wilkin, Studholme Brothers, Caverhill, Trolove, F. D. Rich, Goldney Brothers, and J. and S. Bealey were among the list of buyers. With later acquisitions, F. D. Rich obtained a large part of the flock originally owned by his father and himself. Shipments still went to Melbourne until 1862, but F. D. Rich continued to take a leading position as a New Zealand Merino breeder in Otago.

The Northern Agricultural and Pastoral Association held a show at Oamaru in 1863 which was outstanding, and F. D. Rich, exhibiting 128 of his sheep, obtained every prize for which he competed. E. A. and R. Julius, W. H. Teschmaker, and Barton and McMaster were other exhibitors in the Merino classes.

Observers commented that "Whenever the problem is solved as to the precise type of sheep most profitable to breed in the Middle Island, it will

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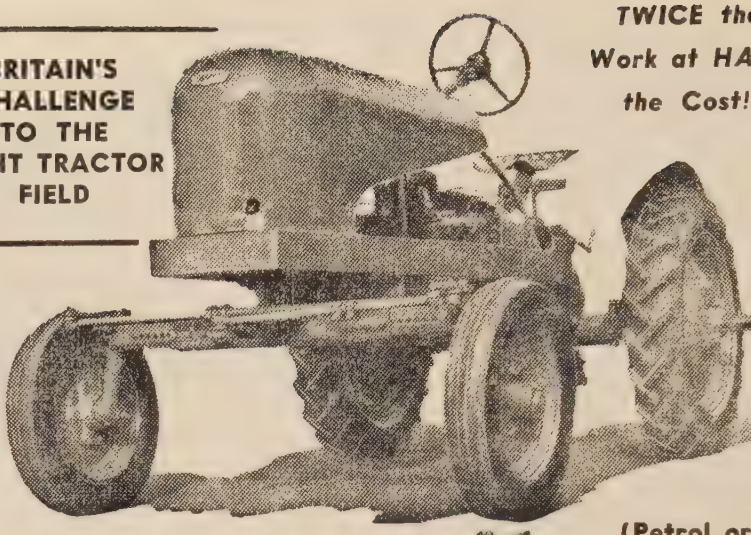

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be an entirely distinct and different type of animal from that of the Australian Merino."

If the Riches, father and son, had the best of the sheep, numerous others were close behind. Newspaper reports of the time show that in Otago J. C. Buckland and a Mr. Williams entered Merinos originating from Rich's flocks. Other Merino exhibits were of Spanish-American and French Merino blood. Exhibitors at Timaru shows in that period included F. D. Rich with his champion ram Perfection—a 6-tooth bred at Palmerston "and hardly to be surpassed for size and symmetry of frame, combined with a weighty, lengthy, and beautifully square staple."

M. Studholme, vice-chairman at the Oamaru Ram Fair of 1867, paid a glowing tribute to the contribution to sheep breeding made by F. D. Rich, saying: "That gentleman and his father have done more to improve the breed of sheep in the colony than any other breeders. Whenever Mr. Rich's sheep were brought into competition with others—whether imported from America, Germany, or the Australian colonies—they always stood highest and were sure to carry the prizes." The president of the Timaru Agricultural and Pastoral Association, W. K. Macdonald, speaking at the annual dinner, acknowledged that in yielding the first prize to Otago, it was no "demerit" to be beaten by the first breeder of the colony.

*[From "Merino Sheep" (1868).* Perfection, an outstanding Merino ram bred by F. D. Rich at Palmerston. It was being exhibited at A. and P. shows about 1863.

## Importations of Other Breeds

As early as the late 1840's some New Zealand breeders had begun experiments in crossing the Merino with the Southdown. British breeds, both long-woolled sheep and Downs, were imported quite early. Though claims have been made that the first Romney sheep entered Auckland Province in 1842, it is well established that important introductions of the breed began with a shipment by William Bennett and Leonard Young. They bought 16 ewes and 4 rams from Jeremiah Solomon, of Northfleet, Kent, and these, or the survivors, arrived at Wellington on September 2, 1853. It appears that Bennett sold out to Young, who, it is thought, sold the sheep to A. Ludlam, of Waiwhetu, Hutt. Ludlam is the earliest breeder of Romneys recorded in the North Island.

In the South Island Dr. Webster, to be famous for his early encouragement of James Little in Corriedale experiments, is thought to have brought Romneys with him to Windermere (near Maheno) when he arrived in 1865. It is possible also that he bought some of the Ludlam Romneys sent to the South Island. Webster won prizes in a class for "other breeds" in the Oamaru show of 1867, doubtless with his Romneys.

Early newspaper accounts of agricultural and pastoral shows give some evidence of the gathering impetus with which long-woolled and Down sheep were introduced.

A report in the "Oamaru Times" of the first Northern Agricultural and Pastoral Association Show, held in Oamaru in 1863, stated: "There were seven sections for Merinos and one for Leicesters (English Leicesters), and Cheviots were also exhibited." In the following year the "Times" stated of the Merino entries: "It is the unanimous opinion of the judges and other gentlemen of long colonial experience among sheep that they have not seen

### FIRST INTRODUCTIONS OF SHEEP BREEDS INTO NEW ZEALAND*

| Breed | Date of arrival and ship | Number of animals | Introduced by | Province | Breeder | Introduced from |
|---|---|---|---|---|---|---|
| Merino | May, 1773 (Resolution) | 1 ram, 1 ewe | Captain James Cook | Marlborough | | Cape Colony |
| Merino | December, 1814 (Active) | | Samuel Marsden | Auckland | Samuel Marsden | New South Wales |
| Merino | May, 1842 (Jupiter) | | Captain W. King | Taranaki | | New South Wales |
| Southdown | February, 1842 (Timandra) | 2 rams, 10 ewes | Devenish | Taranaki | Briscoe | Dorset |
| English Leicester | September, 1843 (Tyne) | 1 ram | A. Saunders | Nelson | J. Arnold | Somerset |
| Cheviot | January, 1845 (Slains Castle) | 1 ram, 1 ewe | Mackay | Nelson | | |
| Romney Marsh | September, 1853 (Cornwall) | 4 rams, 16 ewes | L. Young, W. Bennett | Wellington | Jeremiah Solomon | Northfleet, Kent |
| Border Leicester | 1859 (Cheviot) | 1 ram, 9 ewes | New Zealand and Australian Land Company | Otago | 1 ram and 3 ewes, Melvin Bonnington; 6 ewes, Duke of Buccleuch | Dalkeith, Scotland |
| Lincoln | 1860 | | Esson Brothers | Wellington | | Lincolnshire |
| Cotswold | October, 1863 (Gothenberg) | 4 rams | | Canterbury | | |
| Hampshire Down | October, 1863 (Gothenberg) | 5 rams | | Canterbury | | |
| Dartmoor† | June, 1864 | 5 rams, 6 ewes | C. Reid | Canterbury | | Devonshire |
| Shropshire Down | 1867 | 1 ram, 3 ewes | C. Williams | Canterbury | | England |
| Norfolk Down | 1868 | | W. Wilson | Canterbury | | |
| Alpaca† | November, 1877 | 1 ram, 1 ewe | R. H. Rhodes | Canterbury | | |
| Wensleydale | April, 1894 | 1 ram, 2 ewes | W. B. Clarkson | Canterbury | Ram, Hodgen; ewes; W Trotter | Yorkshire |
| Dorset Horn | October, 1897 | 1 ram, 2 ewes | W. Ullyett | Canterbury | | |
| Kent | October, 1897 | 2 rams | J. B. Logan | | | Kent |
| Tunis† | October, 1900 | 2 rams, 6 ewes | H. Harrowell | Auckland | | Tunis |
| Ryeland | May, 1901 | 2 rams | Dalgety and Company | Canterbury | | Herefordshire |
| Ryeland | December, 1901 | 2 rams, 5 ewes | W. P. Kellock | Canterbury | | Herefordshire |
| Oxford Down | July, 1904 | 1 ram, 5 ewes | J. Withell | Canterbury | Ram, F. B. Barling; ewes, C. Watkins | Herefordshire |
| Roscommon† | 1904 | 4 rams, 10 ewes | J. Davies | Wellington | Various | Ireland |
| South Devon | December, 1907 | 1 ram, 16 ewes | W. J. Birch | Wellington | W. Tippet, E. Stokes | Devonshire |
| South Devon | 1907 | 1 ram, 12 ewes | Chambers Brothers | Hawkes Bay | Various | Devonshire |
| Bharal† | July, 1908 | 2 rams, 2 ewes | N.Z. Tourist Department | Finally liberated in Canterbury | Jamrach | Kuin Lun Mountains (Himalaya), Tibet |
| Scotch Blackface† | August, 1908 | 2 rams, 4 ewes | Mrs. Townsend | | | |
| Suffolk Down | December, 1913 | 1 ram, 6 ewes | G. Gould | Canterbury | Ram and 2 ewes, S. R. Sherwood; 4 ewes, Chivers and Sons | England |
| Dorset Down | November, 1921 | 2 rams, 5 ewes | J. C. N. Grigg | Canterbury | T. R. Spiller | Dorset |

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* J. G. Cook in "The New Zealand Journal of Agriculture" for March, 1924

† Only importation of this breed

# IMPORTATIONS OF SHEEP BREEDS . . .

[*From "British Pure-bred Sheep" (National Sheep Breeders' Association of Great Britain.)*

A present-day English Leicester of Britain.

so many pens of first-class Merinos, taken whether for symmetry of form or profit."

Breeders of Merinos in Otago seem to have been in the front rank, but the "Times" also referred to British breeds: "In the class of long-woolled sheep there was a much larger number of exhibits than last year respecting the Cotswolds, Leicesters (English Leicesters), and Lincolns, and there were also a few Cheviots shown." One long-woolled English Leicester ram shorn the morning of the show was "a magnificent animal," the fleece weighing 15½lb.

At the Oamaru show of 1865 "for a splendid pen of the Romney Marsh breed Messrs. Webster and Aitken were awarded the prize for the best three 4-tooth rams of any breed. Messrs. Buckland and Holmes and Campbell were also successful in the class." In 1867 sheep were again exhibited as Merinos, long-woolled sheep, and other breeds. Webster and Aitken won all four prizes for "other breeds," probably with the Romneys which Webster had brought out with him in 1865.

It is apparent that long-woolled sheep, made up of English Leicesters, Lincolns, and Cotswolds, were still being exhibited as one class, while the class for "other breeds" probably contained some Downs, as well as Romneys.

However, the "Oamaru Times" of November 16, 1865, quoting a Christchurch report of the Canterbury Agricultural and Pastoral Association annual exhibition, mentioned separate classes for Merino, long-woolled, and short-woolled sheep. The report is rather scathing about the poor representation of Merinos, both in number and quality, "considering the large importations of fresh blood which have taken place from time to time, having for their object the improvement in this breed of sheep." Exhibitors in the long-woolled section included J. Richards, Lewis, M. J. Burke, Wright and Murray, C. Williams, and H. J. Tancred. In the short-woolled section among the names mentioned were Washbourne, A. Whincop, and Ladbrooke Innes. Williams received an extra prize for a pen of 5 Shropshire Down ewes. G. Gould exhibited "some Dishley Leicesters from that old and pure stock which has not been crossed with any other blood for the last 50 years."

## The Search for a Paddock Sheep

It was natural that sheep owners should turn their attention to the British breeds, especially as the Merinos were not successful as paddock sheep. Paddocks rapidly became essential as the system of farming advanced and "sheep better adapted for grazing on cultivated grasses in enclosed lands" were required.

The problem of finding the right pasture and the right breed of sheep is well illustrated in an account given by the late James Hay of Pigeon Bay, Canterbury: " . . . For instance, we put down rich English grass, with the dire result that the sheep were attacked by foot-rot. We had at that time a beautiful little flock, but it became absolutely necessary to get rid of them. Then my father (Ebenezer Hay) bought crossbreds and Romneys, as these were better able to resist the disease."

The Border Leicester was favoured in the southern half of the South Island, though some breeders introduced the Lincoln. English Leicesters were introduced into Canterbury in the early 1860's and their importation continued, together with that of Lincolns and to a lesser extent Romneys.

[*From "British Pure-bred Sheep" (National Sheep Breeders' Association of Great Britain).*

A present-day Romney Marsh of Kent.

In a list of "First Introductions of Sheep Breeds into New Zealand" in the "Journal of Agriculture" for March, 1924, J. G. Cook showed that before 1870 these British breeds had been introduced: Southdown, English Leicester, Cheviot, Romney Marsh, Border Leicester, Lincoln, Cotswold, Hampshire Down, Shropshire Down, Norfolk Down, and Dartmoor. Some breeds such as the Norfolk Down and the Dartmoor did not gain a foothold in this country.

In what was apparently the only introduction of the Dartmoor, Charles Reid imported 5 rams and 6 ewes from Devonshire on June 5, 1864, for his Westerfield Station, Ashburton. He put Dartmoor rams to Merino ewes and is said to have persevered with the cross for 3 or 4 years, producing satisfactory results. They were bred and fed on the native grass on the plains and clipped unusually heavy fleeces. The wethers when 3 years old were sold to west coast dealers. As the Lincoln and English Leicester became more fashionable in the district and the estate improved, Reid crossed half-bred and three-quarter-bred Dartmoor ewes with Lincolns and Leicesters, keeping no Dartmoor rams. At this stage he considered that the pure Dartmoor was not as profitable for close farming as the Lincoln or Leicester. He was of the opinion, too, that the crossbred wool was not as good as that from the Lincoln or Leicester, but was better suited for rough country, the fleece being heavier.

The Cheviot had been introduced into Nelson in January, 1845, and into Canterbury and Otago some time later. The experience with the Cheviot cross in the rugged scrub country of Otago seems to have been rather unhappy. It was found that the crossbred wool did not stand up to bush pulling, being torn and cut about on the neck, belly, and flanks.

## The Trend toward the Romney

The Romney was first introduced to the North Island in 1853, Ludlam becoming the first Romney breeder. Within the following 10 years Dr. Webster on his "Kakanui" estate (later named "Balruddery"), J. C. Boys of Rangiora, and J. B. Reid of "Elderslie" were all noted breeders in the South Island. Thus began the trend toward the Romney, which in time became popular and useful in all parts of the North Island.

The early settlers in this island had first followed the clear country, and this was rapidly stocked with Merinos. Settlements worked northward through the clear country of Hawkes Bay, and some Merinos even reached the neighbourhood of Hicks Bay. As in the South Island, English grasses were sown on the better areas and these improved lands became unsuitable for the Merino. The change to a Lincoln cross was made, and on the better-class lands these sheep became the major stock and for some years gave satisfactory returns.

A. C. Morton, in an article, "North Island Wools—A Review," published in the magazine "Wool" by the Massey College Wool Association (1948), gives a clear picture of North Island sheep development in relation to the Merino, Lincoln, and Romney. He points out that in the tussock areas, originally stocked with Merinos from the east, the virgin tussock suited these sheep well, but the disposal of surplus stock was a problem and unremunerative; so here, too, the sheep farmer turned to the British breeds. Long-woolled

An English-type Romney of 1913.

rams—Lincoln, English Leicester, and later Romney—were used for crossing with satisfactory results until the invasion by rabbits. Deterioration of pastures followed and some areas were abandoned. Better management later enabled a good type of Romney cross to be carried, while on the poorer country the stock became a poor type of Corriedale or half-bred.

Farmers on the west coast of the North Island, where the rainfall was greater, were later in developing crossbreds, as settlement was retarded by the Maori wars, by the difficulty of access, and by the extensive tracts of forest country. The breaking in of the forest country is one of the epics of the pioneering days, though many men fell by the wayside.

When the extensive clearing of forest land began, the Lincoln was the leading North Island sheep and for some years the cleared country was stocked with them. Morton says: "Early clips from bush farmers were badly charcoal stained; back and belly wool, in many cases of bad burns, were rubbed on logs and under branches, and in many cases were almost worthless. . . . Small wonder that the pioneers bred 'just sheep' for many years. The effect of this indiscriminate breeding is still apparent in many of the sheep seen in our saleyards."

However, as the country was broken in and the bush-clad hills were converted into pasture with better management, the Lincoln cross was found to be unsuitable because the sheep were not good foragers, though in rough country the Lincoln was still favoured, as its wool was not pulled off the neck and belly as in other breeds. The Romney was also found to be earlier maturing and more resistant to foot-rot, and the young stock were reared more easily.

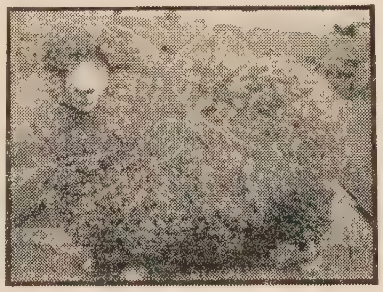
In many parts of the North Island, fern country still offers a stubborn resistance to breaking-in. After the fern was burnt and grass seed sown, the initial fertility resulted in excellent pastures. The land was stocked with Shorthorn cattle and Lincoln sheep. High-class stock was bred, but fertility declined and neither Lincoln nor Shorthorn could thrive. Hogget mortality became abnormal and cotted fleeces in ewes and hoggets general. The difficulty of rearing hoggets was not solved until winter food was grown. For this reason and because of their trouble with internal parasites, Lincoln hogget losses had been very considerable.

So it was with desperation that many farmers turned to the Romney, which had been achieving prominence in the South Island, the Hutt Valley, and the Wairarapa. Romney rams were used on the existing flocks with an immediate improvement in hardiness, and in time the Lincoln retained its identity in only a few stud flocks.

A New Zealand-type Romney of 1913.

**This change from Lincoln to Romney blood was general and rapid throughout the North Island, and by 1913 it appeared that the Romney was to be the dominating breed in many districts of the Dominion, more particularly in the North Island. However, there is still evidence of the influence of Lincoln blood in many North Island crossbred flocks.**

Early breeders had established Romney studs and in some cases endeavoured to improve their flocks by importations from Kent. They found, however, that these sheep did not suit New Zealand conditions entirely, particularly in districts where a type of wool better able to withstand rough conditions was required. Therefore breeders set about developing types more suitable to the country. It is held now that the Romney of New Zealand, though there are various types, as in other breeds, is not only a different type from that of Kent, but a better type. New Zealand Romney breeders claim that they have retained constitution and good carcass conformation with a fleece of heavier, more even, and better-quality wool. Certain it is that the New Zealand type is better suited to the environment in which it is run and for the requirements of the country's sheep and wool industry. Other countries have been interested in the New Zealand Romney breed, and just before the First World War breeders were exporting sheep in fairly large numbers to both North and South America. Exports to Australia were a later development.



[*J. H. Daroux photo.*

A present-day New Zealand stud Romney.

By 1914 sheep breeding in the North Island was more or less stabilised. The Merino remained only in small numbers in the tussock country. Corriedale or half-bred types were found in a few places in the Wairarapa, Hawkes Bay, and North Auckland, and wholly Lincoln flocks had become practically non-existent. The English Leicester was tried in Hawkes Bay, but by 1914 its influence was not significant and the Romney reigned supreme.

A present-day New Zealand stud Corriedale.

## Need of Market for Mutton

However, for some years before 1881 the attention of stock breeders in New Zealand, and particularly in the South Island, was directed to the serious question of finding a profitable outlet for their fat sheep and cattle. Stock numbers had increased enormously because of the large extent of country brought into cultivation and the natural capacity of the colony for growing excellent root and grass crops.

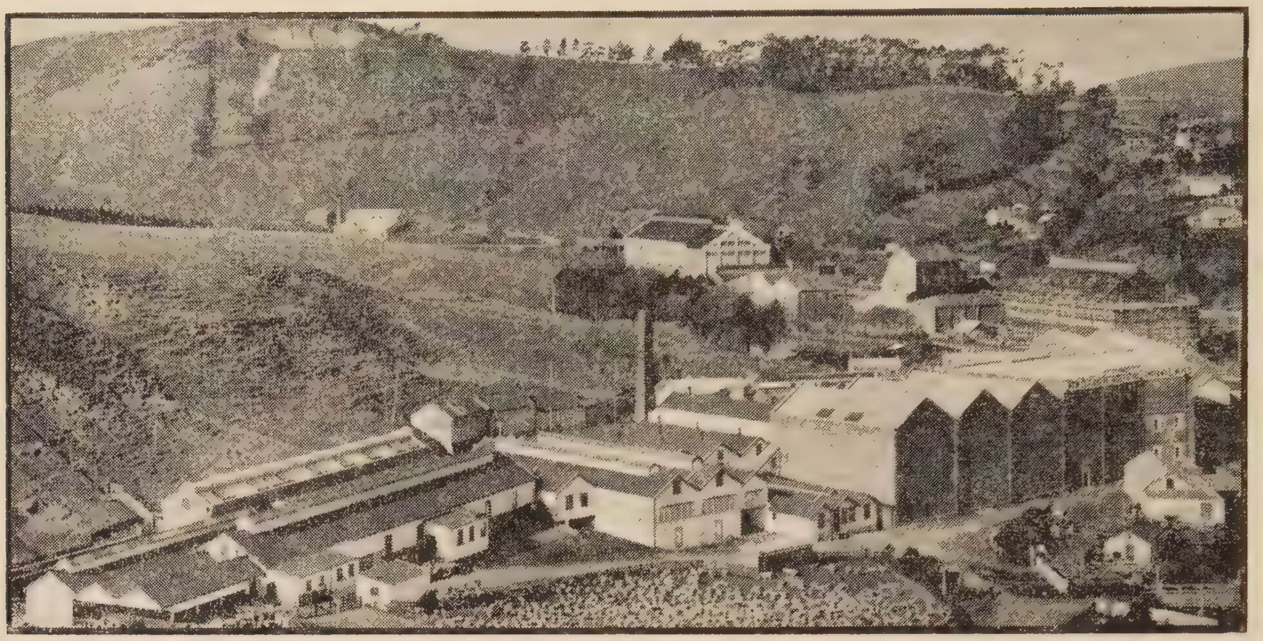
In 1858 there were 1½ million sheep in the country and by 1861 these had increased to 2¾ million. By 1881 the number of sheep had increased to nearly 13 million and cattle numbered almost 700,000. Wool, hides, and tallow were the only marketable commodities and the carcasses almost valueless byproducts. The price of wool then fell and there were depressing times indeed until science came to the rescue.

W. S. Davidson, then manager of the Australian and New Zealand Land Company's flock at the Levels (near Timaru), commented forcibly: "I had seen the flocks in New Zealand increase from the want of an outlet until the old sheep were unsaleable, and I had vivid recollections of having to erect yards at the edge of cliffs, into which some thousands of these older sheep were diven, so they might be knocked on the head and thrown over the precipice as a waste product."

Thomas Brydone, the company's superintendent in New Zealand, observed: "The company possessed large flocks of sheep, principally half-breds, and having improved their estates were fattening great numbers of crossbred sheep, which were valuable simply for their skin and tallow, 70lb. to 80lb. sheep being worth only 7s. 6d., mutton of the best quality really being of no value and put through the digester to make into manure. It was the same all over the colony and we were at our wits' end to know what to do. Meat preserving had been tried for a few years and, after a good deal of English and colonial capital had been invested and lost, it had to be practically abandoned."

## Advent of Refrigeration

The success of refrigeration was not just an accident, but was the fruit of long and careful research and the untiring efforts of men like Mort in Australia, who gave the work of a lifetime and their whole private fortunes.



[*C. M. Collins photo.*

One of the first freezing works in New Zealand was established at Burnside, Dunedin, in 1881-82. These buildings include part of the original works, and further additions have been made since the photograph was taken.

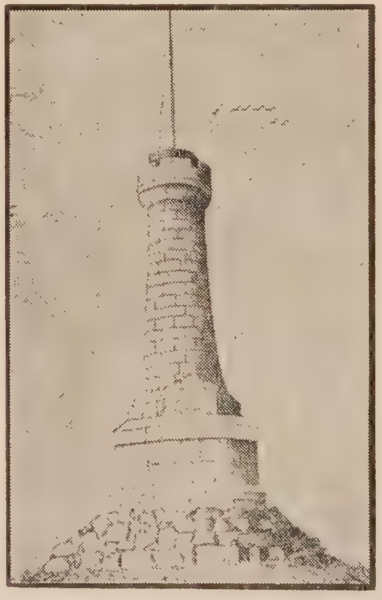
Mechanical refrigeration was subsequently brought to practical satisfactoriness by such men as Bell, Coleman, and Haslam.

Refrigeration had its beginnings in New Zealand in 1882, when the New Zealand and Australian Land Company, through Davidson as manager and Brydone as superintendent in New Zealand, dispatched the first shipment of frozen mutton from Port Chalmers in the Dunedin, the meat being landed in London in sound condition. Brydone personally supervised the killing and dressing of the meat at the Totara Estate, near Oamaru.

**The advent of refrigeration changed the outlook completely, though its great importance became realised only gradually during the 1880's and 1890's, a period of extraordinary economic depression. However, there was a great potential market for mutton in Britain and, though the price for wool was low and some of the shipments of mutton gave very small returns, the sheep and wool industry took on a new complexion.**

Subsequently freezing works were established in Otago and Canterbury, and a great impetus was given to sheep farming, especially in Canterbury. English Leicesters of the old, compact type with symmetrical bodies, short in the leg and early fattened, rapidly came to prominence. James G. Wilson says they were unlike the breed as he saw it later in England, where the exhibits were great, leggy, bony sheep. However, a few Canterbury farmers still preferred the Lincoln and Downs as rams to breed for export.

Brydone, who had considerable experience in breeding crossbred sheep in Canterbury and Otago, said that the company's experience caused it to favour the Border-Leicester cross as the most profitable all round. "The Border-Leicester as now produced in New Zealand is very different from the Home Leicester, as he has been bred with an eye to producing wool as well as mutton, whereas at Home they look principally to the carcass. We put the Border-Leicester ram with the Merino ewe, which produced a sheep carrying a profitable fleece and fattening early, and after which we use the Leicester, excepting with ewes that may be light in their wool, and to these we put the Lincoln rams. In the North Island Lincolns and Romneys have been most in favour, and that may account for the difference in price between Canterbury and Wellington mutton."



[*J. Walsh photo by courtesy of the Otago Early Settlers' Association.*

The Thomas Brydone Memorial Cairn on Sebastopol Hill, Oamaru

## Rise of the Fat Lamb Trade

In Canterbury, however, it very soon became a practice to breed many halfbred ewes from the hill country to the English Leicester and to kill and freeze the lambs. The province was ideally situated for this policy, running Merinos in the higher country, halfbreds on the downs, and English Leicesters on the fattening country on the plains. Canterbury lamb sprang into fame, and the short, plump leg of mutton was most attractive. The whole aspect of sheep farming was changed with the establishment of an export trade, and more and more crossbreds were grown

Canterbury lamb held its own for many years, though Otago also exported lamb of good quality. The North Island was long in following suit, several factors being responsible. In the first place, the railway system was very backward. In Canterbury and Otago the railway ran through the fattening district. In the North Island there was no railway at all to the west coast, and although the Wairarapa was connected with Wellington, Hawkes Bay Province was not.

When freezing works were started eventually, they made good progress from the first, but the circumstances were quite different from those in Canterbury. There were no half-bred ewes, which in Canterbury were found to be such good mothers and the lambs of which fattened early. The ewes were large and those of the Lincoln breed were indifferent mothers. For a long time the sheep frozen were mainly wethers, and the lamb trade was practically left to the South Island.

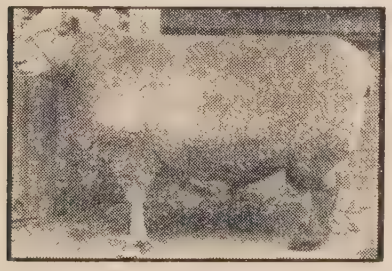
**However, a few breeders who used Southdown rams entered the fat lamb trade with success. As a result of their example the use of Southdown rams on long-woolled crossbred ewes for fat lamb production soon became general. By 1914 the whole of the southern end of the North Island was breeding and fattening lambs to a considerable extent. The Southdown as a fat lamb sire was on his way.**

## The Southdown as a Fat Lamb Sire

Southdowns were introduced into New Zealand very early, J. G. Cook recording the first entry as 2 rams and 10 ewes imported by one Devenish into Taranaki from Dorset, but it must be emphasised that these sheep were, in common with other breeds, intended to produce crossbreds of varying proportions of Merino blood suitable for particular conditions. The use of Southdown rams as fat lamb sires is a comparatively recent development.

Prominent breeders of Southdowns in the 1870's and 1880's were John Deans of Riccarton (who imported from the Prince of Wales's Sandringham flock and from the Babraham flock of Henry Webb), Samuel Garforth of Canterbury, J. B. Reid of Elderslie, Williams and Beetham of Masterton, H. Pannett, of Springston, and Thomas Brooks of Brookside.

However, Southdowns were not popular, and B. Christie, of Oamaru, tells the story of the struggle he had in trying to dispose of J. B. Reid's sheep. Some had come from the Sandringham flock, costing from £200 to £300 per head, but at first £1 1s. could not be obtained for them. Each year for a number of years 10 sheep were sent to the works. At the dispersal sale of Reid's stud a present-day breeder, Mr. H. J. Andrews, bought many of the sheep.



Babraham Buller 3530, a Southdown ram imported by John Deans, of Riccarton, from Henry Webb, of "Babraham," Cambridge, England in July, 1900

After the initial popularity of the Southdown, the demand for the rams slackened around 1920, but by 1927 the Southdown was gaining in popularity in Canterbury as in Southland and the North Island. Now the Southdown as a fat lamb sire is supreme.

Meanwhile importations of breeding stock for crossing had been continued, and among breeds imported the Romney showed qualities which made it highly satisfactory for much of the heavier soils and damper climate of the colony. The Merino breed had receded everywhere in New Zealand, until in the 1920's out of a total of some 24 million sheep in New Zealand they numbered only 750,000. To dispose of their surplus store stock the hill-country estates altered their breeding programmes so as to produce lambs containing less Merino blood.

**Nevertheless, the contest between the use of sheep which produce wool and those which produce meat still continues and shows no sign of ever being decided.**

## Evolution of the Corriedale

Among the early settlers in New Zealand were a considerable number who had experience in the breeding and management of first-class stock and who appreciated the value of quality in their animals. This was a direct result of their earlier contacts and experiences in Great Britain. Good foundation stock, climate and conditions most suitable for all classes of stock, the absence of many Old World diseases, and a good sprinkling of men versed in the art of stock breeding resulted in the quality of New Zealand's stock being maintained at a high level.

The most conspicuous achievement in stock breeding during this period was the evolution of the Corriedale breed by James Little while working as manager on Dr. Webster's estate, "Corriedale," in North Otago. In 1866-67 Little had already begun to in-breed the half-breds from Romney Marsh rams and Merino ewes. The aim was to produce a dual-purpose sheep more suitable for New Zealand conditions than the predominant Merino or the long-woolled breeds which had been introduced. However, when Webster's flock, which was then on "Windermere," was disposed of on his death, Little started the Lincoln cross on Allandale estate, North Canterbury, in 1878. Still later he used English Leicesters as the long-woolled ram. Little was eminently successful, and by careful selection following his initial work the Corriedale breed has been evolved and has proved its suitability for a very large area of country, particularly in Canterbury and Otago.

The New Zealand and Australian Land Company began breeding Corriedales at the Levels estate, near Timaru, in 1874. W. S. Davidson, who was manager of the company, reported that 8 years were required to bring the sheep to a satisfactory degree of evenness by careful culling.

(*From "The Corriedale, New Zealand" (The Corriedale Sheep Society).*

James Little, originator of the Corriedale breed, had begun to inbreed the half-breds from Romney Marsh rams and Merino ewes in 1866-67 on Dr. Webster's estate, Corriedale, North Otago.

Volume 1 of the flock book of the Corriedale Sheep Society (New Zealand), published in 1924, establishes the "Recording of First Flocks": "At a meeting of the New Zealand Sheepbreeders' Association (South Island) held on March 13th, 1903, it was resolved that the association establish a record of experiments in connection with the breeding of Corriedale and in-bred half-bred sheep." In the New Zealand Flock Book, published in 1905, appears the breeding of 8 Corriedale flocks with the names of their owners.

James Little recorded the controversy over the naming of the breed, which was first exhibited as the "in-bred half-bred." Much support was given to the name "Corriedale" submitted by Little because of the breed's history. The New Zealand and Australian Land Company, which had a good deal of influence at this time, proposed the name "Southern Cross." The controversy dragged on for some time, but eventually the name "Corriedale" was adopted universally.

Romneys, Lincolns, and English and Border Leicesters have been used in making the present-day Corriedale. With the interchange of rams, the blood of more than one long-woolled breed has been infused into some flocks, while in others one cross, such as Lincoln-Merino, has been maintained throughout. The Lincoln appears to have been the most popular ram. One outstanding breeder who used the English Leicester was C. H. Ensor, of whom it has been said that he did more than any other man to make the Corriedale what it is now—"possibly the finest combination wool and mutton breed in the world."

Another system which has many advocates and which has also been successful is the use of fresh rams which are bred by the mating of a purebred long-wool to a purebred Merino—the half-bred of Marlborough, Canterbury, and Otago. The first-cross sheep of any two breeds is perhaps the hardiest and most attractive sheep obtainable, especially when the male is a long-wool. One difficulty in this case is that two purebred flocks have to be kept, and there is often a slight variation in the two parent flocks. These flocks may also change slightly in character.

### DISTRIBUTION OF SHEEP BREEDS IN NEW ZEALAND, 1947

| Breed | Stud sheep | Percentage | Sheep of a distinctive breed | Percentage | Total | Total Percentage |
|---|---|---|---|---|---|---|
| Merino .. .. | 25,065 | 0.07 | 692,824 | 2.12 | 717,889 | 2.19 |
| Lincoln .. .. | 3,388 | 0.01 | 23,948 | 0.07 | 27,336 | 0.08 |
| Romney .. .. | 286,638 | 0.88 | 5,859,780 | 17.93 | 6,146,418 | 18.81 |
| Border Leicester | 14,329 | 0.04 | 25,245 | 0.08 | 39,574 | 0.12 |
| English Leicester | 6,775 | 0.02 | 21,611 | 0.07 | 28,386 | 0.09 |
| Shropshire .. | 489 | Negligible | 2,762 | 0.01 | 3,251 | 0.01 |
| Southdown .. | 176,480 | 0.54 | 270,183 | 0.83 | 446,663 | 1.37 |
| Corriedale .. | 41,742 | 0.13 | 1,066,322 | 3.26 | 1,108,064 | 3.39 |
| Half-bred .. |  |  | 2,181,170 | 6.67 | 2,181,170 | 6.67 |
| Ryeland .. | 7,294 | 0.02 | 5,639 | 0.02 | 12,933 | 0.04 |
| Other breeds .. | 8,868 | 0.03 | 13,151 | 0.04 | 22,019 | 0.07 |
| Crossbreds .. |  |  |  |  | 21,948,096 | 67.16 |
|  | 571,068 | 1.74 | 10,162,635 | 31.10 | 32,681,799 | 100.00 |

The sheep included under "other breeds" are mostly such types as Cheviot, Suffolk, and Dorset Horn, but they are very much in the minority and are of no economic importance at present.

The striking point about this table is that the Merino, which was the foundation of New Zealand's sheep industry, has now receded until the Merino type represents only 2.19 per cent. of the total flock. The Romney, on the other hand, now not only constitutes almost 17 per cent. of the flocks as a distinctive breed, but is also the predominating strain in the large percentage of the Dominion's sheep described as crossbreds.

## Distribution of Breeds

The distribution of breeds throughout the Dominion can best be studied from three aspects—stud sheep which are entered in flock books, sheep of a distinctive breed but not entered in flock books, and crossbreds and those not otherwise enumerated. It can be assumed that within reasonable limits the incidence of stud registrations reflects the type of flock sheep aimed at and the system of management employed in the district.

The main point of difference between stud sheep of the North and South Islands is that the North is mainly concerned with Romney and Southdown studs, with Lincoln and Ryeland of small moment, whereas in the South Island Merino, Romney, English and Border Leicester, Southdown, and Corriedale are all of considerable importance.

In the North Island Romney characteristics predominate in flock sheep of distinctive breeds; the incidence of Southdown blood is of minor importance, and the other fine-wool breeds are negligible. In the South Island distinctive breeds are more prevalent than in the North, the effect of the Merino on the composition of flocks being very apparent. This is reflected particularly in the enumeration of half-breds, which, though present in the North to a very limited extent, assume real importance only under the harder conditions of the South Island. These conditions also suit the Corriedale breed. The Romney, on the other hand, is relegated to fourth place among distinctive breeds.

The great bulk of the Dominion's sheep flock enumerated as crossbreds are necessarily of a mixed type, with graduations in breeding from comparatively pure strains to sheep of very uncertain breeds. This wide variation in more than two-thirds of the total flock presents a problem to those aiming at wool improvement. Though the influence of finer-woolled breeds still persists in the south, the Romney and Romney cross are favoured in certain localities, particularly in the lower country of Marlborough, Nelson, Westland, and Southland. Even in Canterbury, Romney strains have been introduced of recent years in increasing numbers because of an insufficient supply of Merino ewes. This has been accompanied by greater use of Southdown rams in the production of fat lambs. In Otago areas, fine-woolled sheep of the Merino, Corriedale, halfbred, and Southdown types still predominate, but again Romneys are present in increasing numbers.

In the North Island, which has a more equable climate and a heavier rainfall, the fine-woolled breeds have never been an important factor in sheep management. A plentiful supply of easily-grown pastures, a consequence of the felling of large tracts of bush, has made the establishment of the quick-growing, heavy-framed, and long-woolled sheep simple, and thus the Romney has held undisputed sway as a foundation for practically all flocks. The use of Southdown rams is almost universal for the production of fat lambs from long-woolled ewes.

### PRESENT DISTRIBUTION OF SHEEP BREEDS IN NEW ZEALAND BY DISTRICTS

| District | Number of sheep shorn | Total area occupied (acres) | Sheep shorn per 1000 acres | Estimated lambing percentage | Dairy cows in milk per 100 sheep shorn | Predominating breed of sheep |
|---|---|---|---|---|---|---|
| Northland | 1,125,264 | 3,103,247 | 363 | 92.53 | 31.61 | Romney |
| Auckland | 2,969,299 | 4,762,624 | 623 |  | 19.70 | Romney |
| Gisborne | 2,047,925 | 2,005,389 | 1,021 | 90.17 | 1.94 | Romney |
| Hawkes Bay | 3,990,850 | 2,778,120 | 1,437 |  | 1.23 | Romney |
| Taranaki | 933,680 | 1,358,846 | 687 | 94.71 | 23.43 | Romney |
| Wellington | 6,580,564 | 5,156,596 | 1,276 |  | 3.21 | Romney |
| Marlborough | 981,060 | 2,218,880 | 442 | 85.86 | 1.35 | Half-bred and Merino |
| Nelson | 385,173 | 1,157,871 | 333 |  | 8.09 | Romney |
| Westland | 67,512 | 988,387 | 68 |  | 18.22 | Romney |
| Canterbury | 4,628,066 | 8,134,913 | 569 | 91.46 | 1.28 | Half-bred and Corriedale |
| Otago | 3,511,588 | 8,126,804 | 432 | 97.22 | 0.97 | Half-bred and Romney |
| Southland | 2,993,791 | 3,308,147 | 905 |  | 1.60 | Romney |
| Dominion totals | 30,214,772 | 43,099,824 | 701 | 93.11 | 5.49 | Romney |

This table shows the extent to which the Romney has become the predominating breed, not only in the North Island, but in Nelson, Westland, and Southland. It also emphasises the greater diversity of distinctive breeds in the South Island.

A number of British breeds, such as the Cotswold and Wensleydale, have been introduced into New Zealand but have not survived the test of time. Others, such as the Ryeland, Shropshire, Cheviot, Suffolk, and Dorset Horn, are present in only very small numbers and are of little economic importance at present.

## New Developments Still Possible

Breeds of sheep and systems of sheep farming may now be said to have been stabilised in New Zealand, but no doubt the future will bring changes of some kind for the industry. Two instances of fresh development with sheep breeds may be mentioned: First, the aim of some breeders in the South Island " . . . to establish a new breed by crossing Suffolk and Southdown with a view to producing a sheep having Southdown characteristics with a maximum of lean meat"—the South-Suffolk; and, second, the introduction of the Cheviot into certain hill country of the North Island to cross with the existing ewe flocks. W. R. Hewitt, of Massey Agricultural College, has issued a warning against hasty change from accepted breeding policies, but at the same time it would seem imperative that sheep farmers retain open minds on such subjects.

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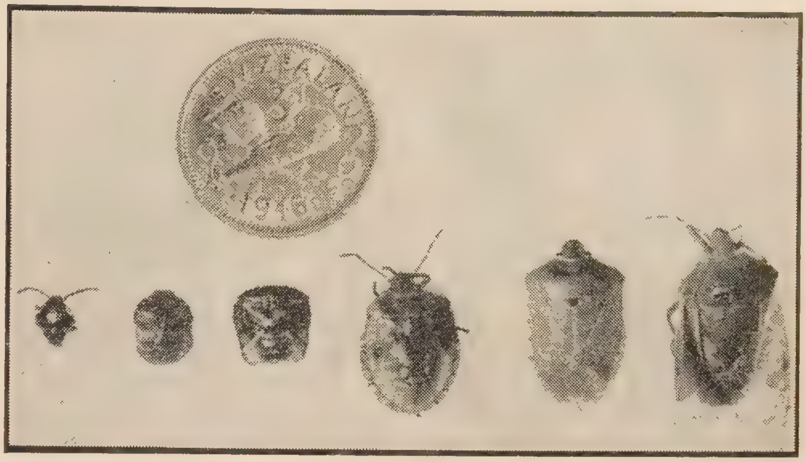
"The New Zealand Journal of Agriculture," and newspapers.

# SPREAD OF GREEN VEGETABLE BUG

By P. EVERETT, Orchard Instructor,
Department of Agriculture,
Auckland.

THE green vegetable bug (*Nezara viridula* L.) is now firmly established in several localities in New Zealand and is spreading rapidly. The pest, which was described by R. A. Cumber in the December, 1949, issue of the "Journal," has proved to be a formidable enemy where established in both commercial and household gardens. Many kinds of vegetables, flowers, fruit, and weeds are subject to attack. The observations reported in this article show how extensive infestation may become where no control measures are adopted.

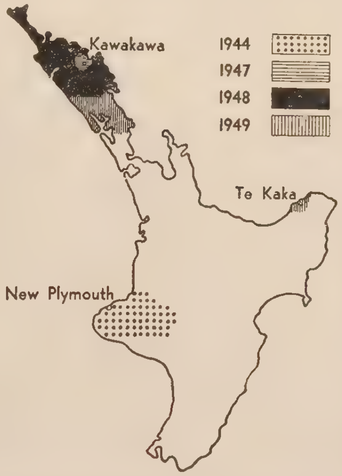


[*Sparrow Industrial Pictures Ltd. photo.*

Green vegetable bugs: The four on the left are nymphs and the two on the right are adults.

ALTHOUGH the green vegetable bug was first recorded in Northland early in 1946, and then appeared to be confined to a few household gardens in Kawakawa, within the next 3 years it had been seen in or reported from nearly every settlement from North Cape to as far south as Maungaturoto. From the original infestation recorded at New Plymouth in 1944 the pest has now spread throughout the Taranaki Province. The only other area in New Zealand so far known to be infected extends for a few miles along the coast on either side of Te Kaha in eastern Bay of Plenty.

**Should the spread of *Nezara* continue at the same rate as during the past few years, at least the whole of the North Island will have become infested within the next 4 or 5 years.**



Spread of infestation by the bug.

## Effect on Host Plants

The damage inflicted on host plants is caused by the bugs piercing the soft plant tissues with their stylet-like mouth parts and sucking the sap. Both the nymphs and adults feed in this manner. Host plants include nearly all vegetable plants commonly grown in New Zealand, tree tomato, citrus, passion fruit, and probably many other fruits. Sweet corn, maize, and various weeds and grasses are also common host plants. It is reported (1) that in Florida the bugs injure the growth of young citrus trees and damage much fruit in bearing groves, and in some cases up to 50 per cent. of the crop has been either destroyed or rendered unfit for market. They damage oranges and mandarin-oranges to an even greater extent, by piercing the rind and sucking the juice from the sections. If sufficient juice is extracted, the fruits drop. So far no injury to citrus in New Zealand has been observed.

The bugs feed on all parts of growing sweet corn and maize, but the principal damage is caused by extracting the "milk" from the immature seeds, which soon collapse and turn a dark colour. Runner beans and tomatoes are among the most-favoured host plants. Immature bean pods on which bugs have been feeding frequently wilt, turn yellow, and eventually fall off. Tomato fruits subjected to severe infestation develop a dry, corky layer about ⅛in. beneath the skin. Such fruits are unfit for market and are of little use; the plants rapidly lose vigour and consequently develop few fruits.

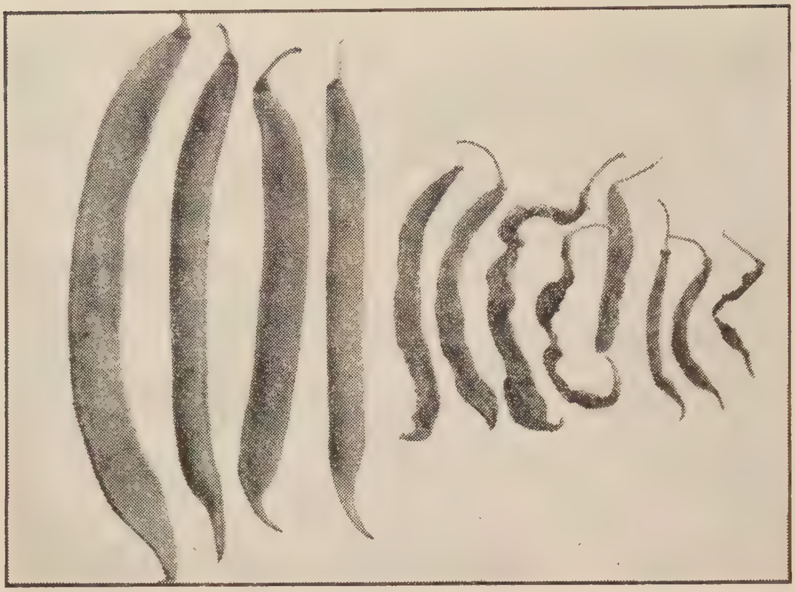
During the period January to May, 1949, severe infestation occurred in most domestic and commercial gardens throughout Northland and the Taranaki Province and extensive damage to many vegetable crops was reported, especially autumn crops of beans, which in some gardens were rendered practically useless.

[*Sparrow Industrial Pictures Ltd. photo.*

Egg rafts of green vegetable bugs.

**To indicate the extent of the infestation in some areas it can be stated that up to 150 bugs have been counted on a single plant of silver beet and more than 50 on a single pumpkin.**

# SPREAD OF GREEN VEGETABLE BUG



[*Sparrow Industrial Pictures Ltd. photo.*

Scarlet runner bean pods. Normal pods at left; shrivelled pods on right were taken from plants severely infected with green vegetable bugs.

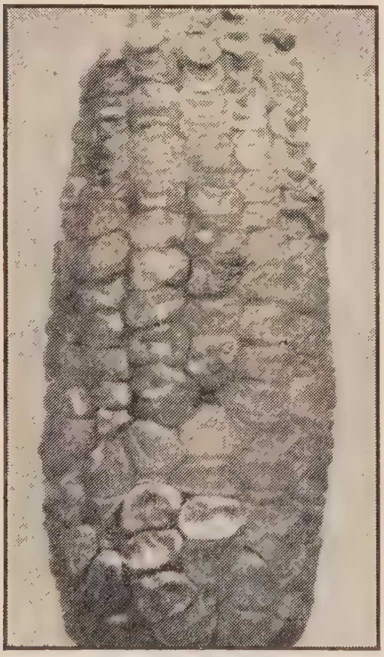
From a 10-acre block of sweet corn grown near Waipapakauri for canning, only 1¾ tons was accepted by the cannery, the balance of the crop having been spoiled by the bugs for use in that way.

## Control of Bugs

The evidence available from other countries indicates that the green vegetable bug cannot be controlled satisfactorily by spraying or dusting with any of the old-established insecticides such as lead arsenate, nicotine sulphate, derris dust, pyrethrum, or summer spraying oil, although most of these insecticides give some degree of control. It is reported from Australia (2) that control may be obtained by spraying with 0.2 per cent D.D.T. emulsion. Small-scale tests carried out in Northland during the past season indicated that one application of spray containing 0.1. per cent. or 0.05 per cent. by weight D.D.T. to runner beans gave equally good control of bugs in both the adult and nymph stages of development for not less than 8 days and that a second application to the same plants made 16 days after the first application gave good control for not less than a further 26 days.

Further and more comprehensive spraying tests are expected to be undertaken with D.D.T. and other comparatively new insecticides during the present season, but in the meantime the following control measures are suggested:—

1. During autumn and winter destroy all rubbish, dead leaves, weeds, etc., where bugs are likely to hibernate. As a considerable number of the insects have been observed mating during the first week in October, it is important that the destruction of rubbish should take place at least a month before this.
2. At frequent intervals during spring and early summer collect and destroy all egg rafts and bugs visible. (Most bugs will fall to the ground if the host plant is given a sharp shake.)
3. Treat infected plants when necessary with a spray containing ½lb. actual D.D.T. in 100 gallons of water; for example, 1lb. of 50 per cent. or 2lb. of 25 per cent. D.D.T. wettable powder in 100 gallons of water.



[*Sparrow Industrial Pictures Ltd. photo.*

Sweet corn showing collapsed seeds resulting from injury by green vegetable bugs.

It is advisable not to spray silver beet, spinach, and similar plants with D.D.T. because of possible ill effects when the foliage is used for human consumption, but if this is unavoidable, it is suggested that a month be left between the last spraying and harvesting, and even then only the younger leaves should be used. For tomatoes allow an interval of a week between the last spray application and harvesting. Cauliflowers should not be treated with D.D.T. after the curd begins to form.

**As some plants of the cucurbit family, which includes melons, cucumbers, pumpkins, and marrows, may be damaged by the application of D.D.T., the use of this insecticide on cucurbits cannot be recommended until further experimental work in this direction has been undertaken.**

Some vegetable crops, including beans, are liable to become severely infested with red mite after the use of D.D.T., as this material kills certain predators of red mite; when this occurs the mites can be held in check by occasional dustings with a finely ground sulphur to which has been added an equal quantity of hydrated lime.

### Acknowledgment

The assistance given by officers of the Plant Diseases Division of the Department of Scientific and Industrial Research, Auckland, in checking data concerning recommendations for control of *Nezara* is acknowledged.

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2. R. A. Cumber, "The New Zealand Journal of Agriculture," Vol. 79, No. 6, December, 1949.
3. The "Agricultural Gazette of New South Wales," Vol. LX, Part 2, February 1, 1949, page 96.

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**Journal of the British Grassland Society**

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# Concreting Paving and Pressure-resistant Structures

PREVIOUS articles in this series by H. W. T. Eggers, Engineer, Department of Agriculture, Wellington, dealt with the properties and methods of working concrete, the construction of reinforcing and forms, and pre-cast products such as blocks and fencing posts. In this article the use of concrete for foundations, yards and paths, retaining walls, and dams is discussed, and next month the final article of the series will deal with the general uses of cement and concrete.

THE foundations of a building transmit the loads carried by the structure, including its own weight, to the ground beneath. With any structure of a monolithic nature, such as a reinforced concrete building, the foundations must be taken down to solid material to ensure no movement and uniform settlement.

Some points to be considered when preparing foundations are:—

1. Safe resistance of the soil,
2. Atmosphere influence on the soil,
3. Size, shape, and strength of the foundation to give proper distribution, and
4. Possibility of withdrawal of water or soil during future work in the vicinity.

The safe resistance of the soil will determine the area over which the load must be distributed, and the object of the foundation will be to spread this load over an area sufficiently large to prevent a pressure at any point which is greater than the weight the soil can safely bear and to ensure that all the footings will settle uniformly.

A general guide to the safe bearing capacity of various subsoils is given in the table on page 150.

If a building complete with foundations weighs 100 tons and is to be built on soft clay, the minimum allowable area of the foundations will be 100 sq. ft., as the safe bearing capacity of soft clay is 1 ton per square foot. For a building of this weight measuring, say, 60ft. by 40ft. outside measurement the foundations would require to be 6in. wide only, whereas for a building of the same weight measuring 30ft. by 20ft. the foundations would require to be 12in. wide.

The ordinary range of climatic conditions is capable of altering the bearing power of the subsoil to a considerable depth. Long continued frosts or droughts disintegrate soil and cause settlement of buildings with shallow foundations. This is most noticeable when the foundation is on clay. Experience has shown that ordinary foundations on good soil are sufficiently deep if they are taken down to a level slightly below that to which the effects of climate penetrate. Where rock, dry gravel or sand, or dry, stiff clay is not reached at formation level care must be taken that there is no danger of the ground alongside the foundation rising because the footing level is too shallow.

Concrete footings for foundations may be laid plain (in mass) or reinforced. Foundations not reinforced should be used only on hard ground where the soil bearing capacity is uniform and continuous for the full length of the foundation.

Where soil bearing capacity varies over the length of a foundation suitably sized reinforcing must be placed where specified by the designer.

If soil bearing capacity is good and uniform, footings for foundations should, as a general rule, be not less in depth than two-thirds the thickness of the walls they support.

With ground of uneven contour all foundations must be excavated level on the horizontal plane and should be stepped to suit the contour. Stepped foundations should be overlapped at steppings and the horizontal section of the vertical connection between the two levels should be of a strength at least equal to that of the smaller of the horizontally connected sections.

## Machinery Foundations

Concrete is the best material to use for machinery foundations, and plans for foundations for all machinery except the lightest class are usually supplied by the makers. The depth of the foundation is often omitted from the drawings to allow for variable conditions on the site.

Simple box forms are erected and the concrete poured to a level of about ¾in. below the bed plate to allow for grouting in the bed plate after it has been supported and levelled on steel wedges and packings.

Foundation bolts can be cast in the concrete or grouted into previously cored holes. If bolts are cast in the concrete, a wooden template should be made and fixed above the boxing before starting to pour the concrete, the bolts being set in the concrete and held in alignment by the template. For grouting the bolts core boxes of the required length must be made out of light (¼in.) timber and placed in the concrete in the correct position of the bolt holes. These boxes are broken out when the concrete has hardened and the holding-down bolts either grouted in with a 2 to 1 mortar or set in with molten lead.

Cardboard tubes can be used with advantage in place of core boxes, as the cost of making the boxes is high and they have no scrap value.

As the building of heavy structures is outside the scope of the farmer's activities, any contemplated work of this nature should be discussed with a qualified architect, and plans and specifications for the foundations, or for the whole structure, would be prepared better by a qualified person.

## Yards and Paths

Concrete for yards and paths must be of good quality, as paving is subject to much hard usage. In the first article in this series a thickness of 3 to 4in. of No. 2 concrete containing 1in. maximum graded gravel was given as being suitable for light footpaths and dairy and light shed floors.

Concrete paving must be strong enough to distribute any concentrated loading over an extended area; therefore paving subject to heavy loading such as heavy implements or tractors should conform to recommendations of Table 5 in the first article of this series regarding thickness and quality of concrete for heavier floors.

As the crushing strength of good concrete is quite capable of withstanding any normal superimposed loading, the ultimate strength of paving is virtually dependent on the bearing capacity of the subsoil. Paving 3in. thick laid on soft clay would probably break up sooner than the same paving laid on hard clay, other things being equal. For this reason a solid foundation is the first requisite of concrete paving for any yards, floors, or paths. If a uniformly solid foundation cannot be obtained and any part of the paving is liable to be subjected to excessive bending stresses, these stresses should be allowed for by the provision of steel-mesh reinforcing.

However, for most ordinary farm work a reasonably solid foundation and a 3 or 4in. floor of good concrete will be quite satisfactory. The following factors must be considered before laying any paving:—

1. The likely superimposed loading,
2. Subsoil bearing resistance,
3. Thickness of concrete,
4. Grade of concrete, and
5. Reinforcing.

Of these factors the last three will be determined by the first two.

### Levels

Levelling the subsoil for yards, floors, or paths is part of the provision of suitable foundations, one operation being supplementary to the other; that is, a suitable foundation is provided all over the surface to be paved at a distance below the finished paving level equal to the thickness of the paving. Paving is usually finished with a slope or camber to facilitate drainage, and, except in the case of paths, this must be pegged before concreting commences.

Fall or slope in paving is expressed in units of vertical distance per units of horizontal distance, a slope of 1 in 20 being a drop of 1ft. vertically for every 20ft. horizontally or 1in. for 20in. Fig. 1 shows how ground should be prepared for concreting a gradient.

# LEVELLING FOUNDATIONS FOR CONCRETE YARDS

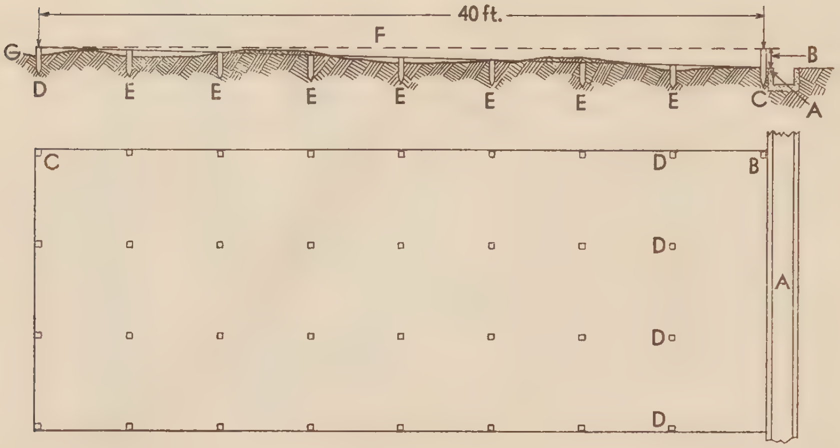


Fig. 1—Method of levelling the foundations for a concrete yard or floor 40ft. wide and with a slope of 1 in 20. Upper: Section through the first line of pegs. A—Edge of drain used in place of the first peg. B—Vertical fall, which is found by dividing the horizontal unit of the slope ratio (20) into the horizontal length of fall (40); that is $^{40}/_{20}$ = 2ft. C—Second peg. D—Third peg. E—Intermediate pegs even with the line of sight between the edge of the drain (first peg) and the third peg. F—Level. G—Ground surface. Lower: Plan. A—Drain. B—Second peg. C—Third peg. D—Lines of pegs even along the line of sight between the back peg and the drain edge and even along the line of sight from side to side. The back line of pegs may be level or sloped toward the third peg if required.

As levels are usually transferred from the lowest to the highest point, the first peg is placed at the level of the lowest point. A second peg is then placed alongside the first at a height in feet above it equal to the number of times the horizontal unit of the slope ratio will divide into the horizontal length of the fall. For example, the vertical fall of a building 40ft. wide having a slope of 1 in 20 is found by dividing the horizontal unit, 20, into the length of fall, 40; this gives a dividend of 2, which means that the floor is 2ft. lower at the front than at the back and that the second peg should be placed 2ft. above the first.

The area is pegged in this way both laterally and longitudinally with pegs spaced at about every 5 to 6ft. in both directions. The ground is then levelled to a distance below the peg tops equal to the thickness of the paving. Any loose material in hollows should be thoroughly rammed before the concrete is placed.

For small areas the concrete can be placed by working from the highest part to the lowest and screeding directly off the pegs with a short straight-edge, the pegs being removed as work proceeds. For larger areas the concrete should be laid in alternate strips between screed boards erected to the level of the lines of pegs. When the strips are hard enough to carry the weight of foot boards the screeding boards are removed and the intermediate spaces filled in and screeded off to the previously laid strips.

The best method of laying concrete paths is shown in Fig. 2. Side boards of thin batten are erected and levelled along the line of the path and the concrete is screeded between them.

Paths can be laid with a camber by cutting a screeding board to the desired shape as shown in Fig. 2.

**Expansion Joints**

As large areas of concrete have a tendency to crack when subject to expansion and contraction through temperature changes, the formation of cracks must be controlled by providing "ready-made" cracks instead of permitting them to occur haphazardly.

This is done by providing "expansion joints," dividing the area of concrete into sections separated by some suitable compressible material such as soft wood or a bitumastic preparation. The compressible material is laid along the edge of one slab and the concrete for the adjoining section is poured against it.

Timber is not recommended for expansion joints in paving for yards, because in time it rots, forming root hold for weeds.

A concrete slab has a tendency to curl upward at the edges during the night when the temperature at the bottom of the slab is higher than the temperature at the top, and to arch in the centre during the day when conditions are reversed. These effects will cause no serious harm, provided the arching or the curling is kept within reasonable limits by restricting the size of the slab. Concrete paving for a yard should therefore be divided into slabs not more than 15ft. wide by 60ft. long or shorter for preference. The width of joints should be regulated according to the distance between joints. Joints at 15ft. intervals may be $\frac{1}{8}$in. wide, at 25ft. $\frac{1}{4}$in. wide, and at 60ft. $\frac{1}{2}$in. wide.

When laying concrete in strips the expansion joint filler material can be placed along the edges of the first strips as soon as the screeding boards are removed and before filling in the intermediate strips.

Expansion joints for paths are usually made by placing thin battens across the path at about 15ft. intervals or in places where cracking is liable to occur, such as across corners.

## Retaining Walls

A wall used to resist the pressure of earth behind it is called a retaining wall. Retaining walls which depend upon their own weight for their stability are classed as gravity walls.

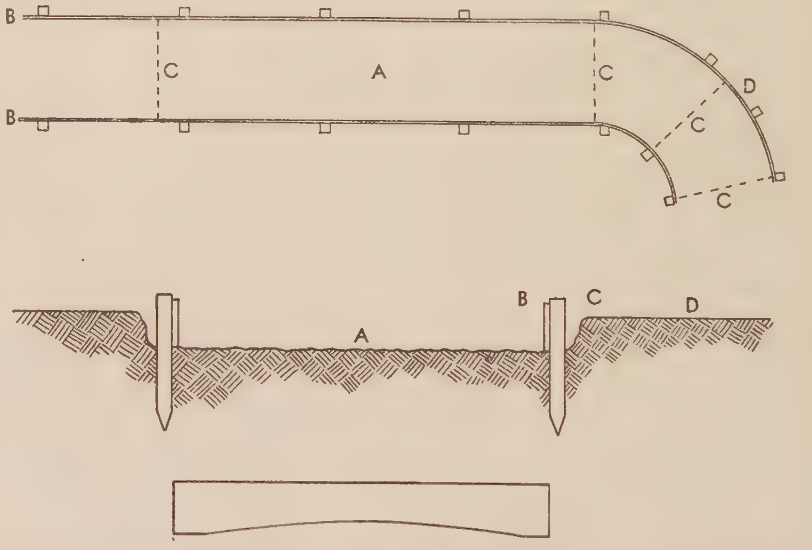


Fig. 2—Method of constructing concrete paths. Upper: Plan. A—Graded path foundation. B—Light battens (3in. x $\frac{1}{2}$in.) nailed to stakes. The tops of the battens are set level with the finished surface of the path and are graded to the path slope. C—Expansion joints. D—Use of light battens enables a curve to be formed easily. Middle: Sectional view. A—Path foundation levelled and consolidated. B—Light batten. C—Stake. D—Ground level. Lower: Screed board for finishing a cambered surface.

Such walls built on firm soil will usually be stable when they have the following proportions:—

Top of fill level, back vertical, and base 4/10 the height.

Top of fill level, back battered, and base ½ the height.

Top of fill steeply inclined, back vertical, and base ½ the height.

Top of fill steeply inclined, back battered, and base 6/10 the height.

An additional factor of safety is obtained by building the face on a batter. Care must be taken in the design of a wall that the allowable soil foundation pressure is not exceeded and that drainage is provided for the back of the wall to eliminate the possibility of creating hydrostatic pressure.

A considerable saving may be made in the construction of gravity walls by the use of "plumbs" or large, hard rock boulders, which give weight and save an equivalent bulk of concrete.

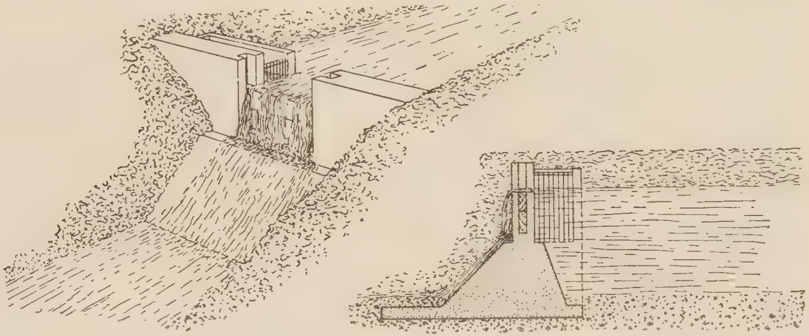


Fig. 4—A solid concrete dam, the storage level of which can be increased by placing planks in the side walls of the crest.

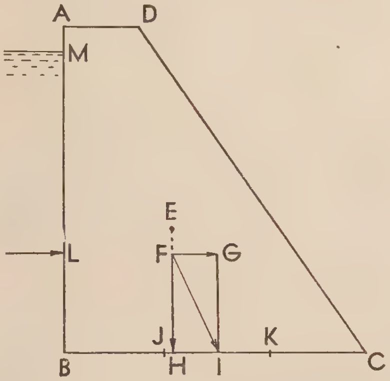


Fig. 3—The forces exerted on a gravity dam which have to be allowed for in calculating the proportions necessary for stability. The method of calculating these forces is explained on this page. FG—Force of water. FH—Force of gravity. FI—Resultant of forces.

Retaining walls of reinforced concrete are made thin, with a broad base, and the wall either cantilevered from the base or braced with buttresses or counterforts.

Economic factors of cost of labour and raw materials justify the construction of reinforced walls of any large size.

The necessity for designing reinforcing (see the second article in this series) applies equally to the construction of walls as to any other reinforced structure. The bearing capacity of the soil is as important a consideration in the erection of retaining walls as it is in the laying of foundations.

## Dams

As the designing of dams is a highly specialised undertaking, the farmer should not attempt to construct other than very small dams solely for ponding purposes. Technical advice must be obtained if the construction of any dam of, say, over 6ft. in height is contemplated, as the positioning, design, and construction must all be done to avoid endangering life, soil, or property.

The principles of design of concrete gravity dams are the same as for gravity walls, which depend on their mass for stability. In each the structure is so proportioned that the centre of resultant pressure does not fall outside the middle third of the base. After retaining walls have been filled the pressure remains stationary, but with dams the centre of pressure moves as the level of the water rises or falls. For this reason calculations for the proportioning of dams are always based on the full reservoir.

Fig. 3 shows how the forces exerted on the dam are calculated so that economic proportions can be obtained. ABCD is the dam in section. When the reservoir is empty the weight of concrete only has to be considered (wind pressure being disregarded) and may be regarded as acting vertically through the centre of gravity (E) on the line EH, which falls within the middle third (JK) of the base (BC). When the reservoir is full to level (M) the horizontal pressure of water, column MB, is regarded as acting horizontally at the centre of pressure L, LM being twice LB.

After calculating the total weight of concrete vertically over a strip of foundation 1ft. wide in the direction of the dam's axis and the total water pressure on a strip of face also 1ft. wide, a parallelogram of forces is drawn in which FH=LB=force of gravity, and FG=pressure of water, FH having the same ratio to FG in length as the weight of the vertical strip of concrete has to the water pressure on the face. The resultant force is represented proportionately by FI. If FI cuts the base inside the middle third (JK), the dam will have the stability required of it under maximum water pressure.

When the reservoir is empty the pressure on the base is greatest toward the heel (B), and as the reservoir fills the area of greatest pressure moves toward the toe (C).

Excessive pressure on any part of the base must be avoided.

Dams arched in plan are sometimes used in narrow gorges with very steep sides. The loading conditions are ideal with water as the load, and the arched form gives stability independently of the mass.

In an article "Establishing a Farm Water Supply," published in the February, 1949, issue of the "Journal," mention was made of the construction of a bag dam, reinforced concrete dam, and solid (gravity) concrete dam. The bag dam is limited in economic size, and the reinforced dam must be correctly designed regarding shape, size, and position of reinforcing if it is to be satisfactory.

On the other hand, a farmer could design and build his own gravity dam, provided the principles given above

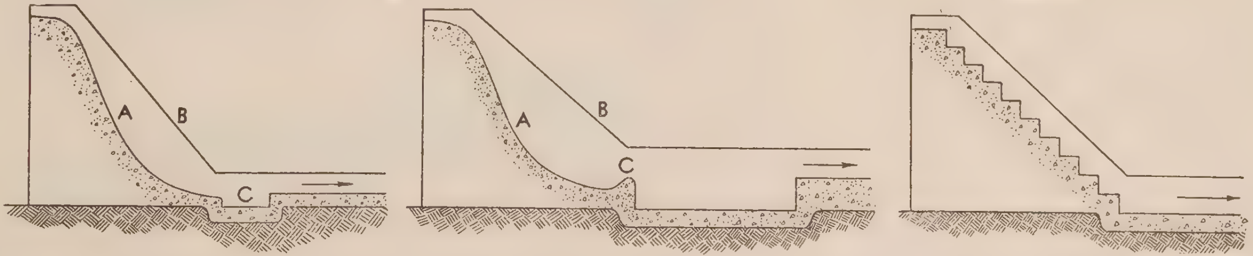


Fig. 5—Stilling basin and energy dissipater for dam spillways. Left: Sectional view of a spillway with a stilling basin. A—Spillway. B—Side wall. C—Stilling basin. Middle: Sectional view of a spillway with energy dissipater. A—Spillway. B—Side wall. C—Energy dissipater. Right: Sectional view of a stepped spillway.

for calculating stability are observed and certain fundamentals regarding foundation work carried out.

Dam foundation sites must be prepared with the greatest care. All unsound rock is cut away even if this means going down to a great depth, and the surface is shaped to give a good key to the concrete. The pressure-bearing resistance of the rock must be considered, and loadings should be well under those given in the table below to allow a wide margin of safety.

The addition of clean, hard rock "plumbs" will save a considerable amount of concrete.

For making the calculations as shown in Fig. 3 the weight of good Portland cement concrete can be taken as 150lb. per cubic foot and the weight of water at 62½lb. per cubic foot.

SAFE BEARING CAPACITY OF SOILS

| Nature of soil | Safe bearing capacity tons/sq. ft. |
|---|---|
| Alluvial soil, made ground, very wet sand .. .. .. | ¼ |
| Soft clay, wet or loose sand .. | ½ |
| Ordinary fairly dry clay, fairly dry, fine confined sand, sandy clay .. .. .. .. | 1½ |
| Medium clay, stiff but capable of being spaded .. .. .. | 2 to 3 |
| Loose, medium, and coarse sand, fine dry sand (confined) .. | 2 to 3 |
| Gravel, coarse sand in natural thick beds (confined) .. .. | 3 to 4 |
| Hard clay requiring picking for removal .. .. .. .. | 3 to 4 |
| Compact sand and gravel requiring picking for removal .. .. | 4 to 5 |
| Soft rock, disintegrated ledge, natural ledge difficult to remove by picking .. .. .. | 5 to 8 |
| Hard-pan cemented sand and gravel difficult to remove by picking | 8 to 10 |
| Sound shale and other medium rock requiring blasting for removal | 10 to 15 |
| Solid ledge of hard rock such as granite, trap, etc. .. .. | 25 to 50 |

**Dam Overflow**

Overflows or spillways for dams placed in streams or creeks must be capable of handling any flood-water. They may be built in the centre of the dam, to one side or even independently of the dam, being fed by a head race.

Very few farm dams will require sluice gates in the spillway to regulate the level of the ponded water, but if regulation of the water level is necessary, say, to increase storage for summer use from a spring fresh, the most simple arrangement is the provision of grooves in the side walls of the crest in which planks can be placed as shown in Fig. 4.

Whatever the positioning of spillways, their profile and formation must be such that the flow of water does not cause scouring of the streambed near the dam site or anywhere where scouring will cause damage. If the spillway is built in the dam, a wide apron, and possibly side walls, must be provided to protect the dam foundations. The bottom of the spillway should be arranged to minimise turbulent flow, and the velocity of the water could be reduced by the inclusion of a stilling basin or energy dissipater as shown in Fig. 5.

Good dams for the formation of ponds or the storage of creek water can be built from soil with a farm tractor. The construction of these dams will be dealt with in a later article.

# A HANDY PLANTING TOOL

THE design and use of a handy gardening tool that can be easily manufactured at home or in any workshop are described in this article by I. L. Brown, Orchard Instructor, Department of Agriculture, Hamilton. It has proved efficient for planting strawberries and lettuce on a commercial scale and would be found useful in any commercial or domestic garden. The tool can be made from almost any suitable piece of scrap metal about ¼in. thick and 1½ to 2½in. wide, such as a piece of a broken leaf from a steel spring.

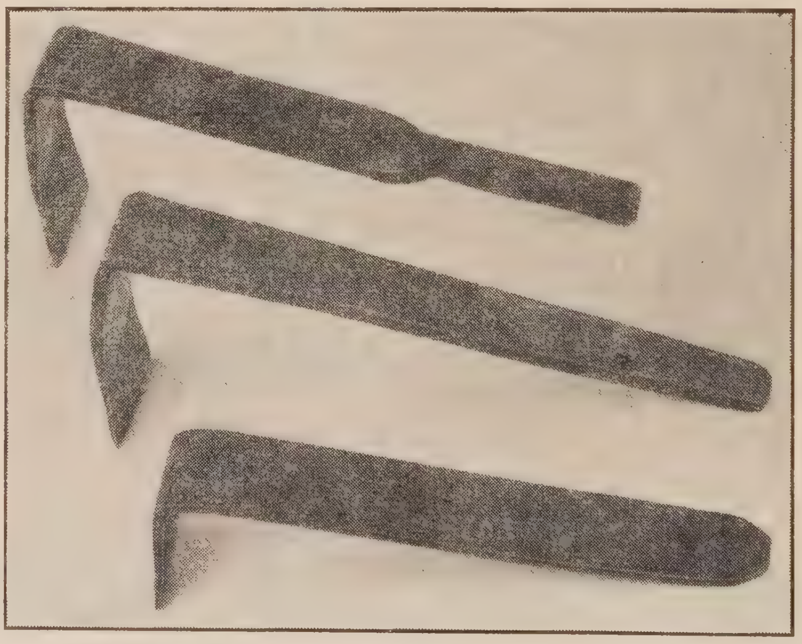
A LENGTH of suitable metal 12in. to 15in. long is bent at a point about 2½in. to 4in. (depending on the length of blade required) from one end. This can be done by heating the metal at the point where it is to be bent and hammering or bending it in a vice to form the angle required. The short side of the bend then forms the blade of the tool and the long side the handle.

It can be used in this form or given a better finish. The blade can be curved very slightly, widened, and sharpened at the cutting end by more heating and a little hammering, giving it a shape similar to most hoes or mattocks. The handle can be also shaped to fit any grip by grinding it or cutting it down to any required width, ¾in. to 1in. usually being suitable. In this form a further improvement can be provided by fastening semi-circular pieces of wood to each side of the handle 3½ or 4in. from the end. To do this two or three holes have to be drilled in the grip part to take screws or rivets for holding the wooden strips in place. The holes in the wood should be countersunk to give a smooth finish to the handle.

The handle can also be shaped to fit most grips by heating and hammering the end 3½ to 4in. into a roll. This makes a very strong and serviceable tool not likely to be damaged by misuse or neglect. A little paint applied when the shaping is finished will help to prevent the tool from rusting and prolong its life.

When planting is being done the tool is driven into the ground with a quick blow and the soil drawn back and held so that the plant can be inserted at the required depth in the hole. The tool is then withdrawn and the soil firmed against the roots of the plant with the back of the blade. After a little practice it will be found that the operation can be performed with a minimum of action and that the roots of the plant are well spread and firmly held by the soil.

The tool, although primarily a planting implement, as the length of the handle can be used as a guide for judging planting distances, will also be found most useful for hand weeding and thinning among closely planted crops.



[*Smith and James photo.*

Three planting tools made as described in this article.

# THE HOME GARDEN IN MARCH

By S. O. GILLARD,
Vegetable Instructor,
Department of Agriculture,
Auckland.

**MARCH is generally regarded as being the end of the gardening season in most districts. Little new planting requires to be done after this month and the principal work consists of encouraging growth and development of crops planted for winter and spring supply. At this time of the year interest in gardening operations tends to diminish and many gardens are allowed to become untidy and weedy. This and the next few months are the test of good gardening.**

[*Green and Hahn Ltd photo.*

IN March the amount of work requiring urgent attention is less than in preceding months, but the keen home gardener will still find plenty to do. Most gardens, especially those that have been well planned, will have ready for harvest crops such as peas, beans, green vegetables, salad crops, root crops, tomatoes, and cucurbits.

To ensure a supply of vegetables in early spring, seed of cabbage, cauliflower, silver beet, lettuce, and spring onions can be sown in most districts, and in locations where growth extends well into the autumn, carrots, radish, beetroot, turnip, and spinach may still be sown in warm positions. In the warmer districts of the north cabbage, cauliflower, lettuce, silver beet, and celery plants can be set out for winter and spring use. To ensure good drainage and maximum soil warmth during winter, planting should be done on raised beds or on mounded rows or ridges. For convenience in cultivating and harvesting the raised beds should not be more than 4ft. 6in. wide.

Earlier-sown crops such as spinach, silver beet, carrots, turnips, and lettuce should be ready for thinning and this work should be done promptly before the seedlings become overcrowded. Cultivation of the soil, weeding, and watering where necessary should not be neglected, as growth becomes less rapid as the days shorten and most plants require some coaxing to keep them growing satisfactorily. Spraying or dusting of brassicas and spraying of celery, tomatoes, and potatoes in districts where fungous diseases and insect pests are troublesome should not be overlooked, even though produce may be reaching maturity.

Onion crops which had not fully matured by last month should by now be fully ripened and ready for harvesting; this should be done on a fine day and the bulbs spread thinly in a double row with tops outward to complete drying. If the soil is wet, the crop should be removed to a more favourable place such as a verandah or garden path. When the tops are thoroughly dry the onions may be stored in a cool, dry shed where the air circulation is good. They may be hung in bunches or placed thinly on a wire-netting rack.

Mature potato crops should be dug without delay and stored, for if left in the ground too long after the tops have died off, they soon begin to develop shoots after the first rains. Because of the damage which may be caused by the potato tuber moth steps should be taken to protect stored potatoes by dusting the tubers with slaked lime or D.D.T. dusting powder.

Kumara crops will be nearing maturity and little attention will be needed other than keeping the vines from rooting by lifting them occasionally; this can be done easily with a hoe or rake handle.

Early-planted tomatoes will now be in full production and if care is taken to see that they do not lack moisture they should continue to produce fruit for some time yet.

When crops have been harvested and the area is not required for replanting for several weeks the soil should be dug and either left in a rough state to secure the benefits of weathering during the winter or sown with a green crop. Green crops turned into the soil regularly rapidly improve both organic content and physical conditions.

Mustard (agricultural) is a quick-growing green crop which takes about 12 to 14 weeks to mature, whereas blue lupins require approximately 20 weeks before they reach the best stage for incorporating in the soil.

A dressing of 2oz. to the square yard of blood and bone broadcast over the area and worked into the soil before the seed is sown will promote quicker and heavier growth.

Pumpkin, marrow, and squash will now be nearing maturity, and if soil conditions are inclined to remain wet, it is advisable to place a piece of flat board carefully under each gourd. If gourds are allowed to lie on wet soil too long at this stage, the underneath portion of the rind is liable to be injured by insects and soil fungi, which will impair the keeping quality.

Beans should be picked as soon as they are large enough to use; continuous picking promotes extended production, whereas leaving pods on to mature and form seeds shortens the bearing life.

When saving bean seed select only disease-free and vigorous plants. Most of the diseases of beans are seed borne.

Weekly applications of animal liquid manure will assist development of crops such as lettuce, spinach, cabbage, and cauliflower. When animal liquid manure is not available nitrate of soda, 1oz. in 4 gallons of water, can be used. Liquid manure should never be applied to dry soil—soil in this condition should always be watered thoroughly first.

The soil should be drawn up around the stems of sweet corn, and if corn is growing in an exposed position, it may require supporting with stakes. During hot weather the cobs mature quickly and they should be gathered while their edible quality is at its best. This condition is known as the "milk" stage, that is, when the kernels will yield a milky juice if punctured. In external appearance the silk on cobs should be brown and somewhat dry and ears should feel firm and plump.

The flavour of sweet corn is best when it is cooked within 24 hours of

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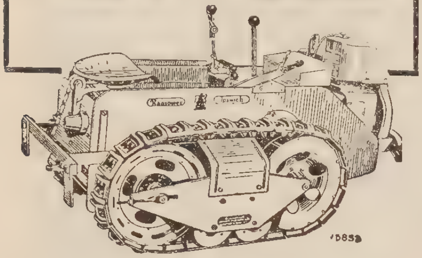

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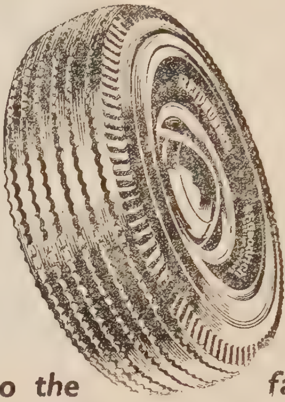

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picking; during hot weather the sugar content deteriorates quickly after picking.

As the roots of celery grow near the surface of the soil, plants may suffer unless the crop is well watered during dry weather. Mulching of rows immediately after plants are set out will aid materially in conserving moisture and in protecting the roots from the heat of the sun. Fresh manure containing a quantity of short straw is perhaps the best material to use as a mulch, but well-rotted manure or compost is excellent and stimulates the growth of the celery.

When the crop is about 3 weeks from maturity it should be put through the finishing stage—blanching—and finally forced for the production of high-quality, long centre stems. Blanching is done by excluding the sun from the stalks of the plants, thus preventing the formation of chlorophyll (the green colouring matter) in the plant cells. The usual practice in blanching is to surround each bed with high boards which should be at least 10in. wide. Another method is to cut sections of wrapping paper and wrap each celery plant separately, leaving only the tops of the plants exposed. Rubber bands or short pieces of string may be used to hold the wrappers in place.

When the boards or collars are in position the beds should be dressed with either nitrate of soda or sulphate of ammonia at up to 1oz. a square yard depending on the condition of the soil and plants. The fertiliser should be watered in immediately. The whole area should not be blanched at one time, but done progressively so that a continuous supply of blanched celery is available.

## Beetroot

Beetroot may still be sown in districts with favourable autumn growing conditions and will help to supply a variety in the home garden in early spring. Like all root crops, it grows best in a deep, rich, sandy loam which has been well manured for a preceding crop. The culture of beetroot was described in the December "Journal." The soil must be firmed to bring it into direct contact with the seed; this is very necessary in dry weather and failure to firm the seed-bed often results in disappointing germination.

*[Sparrow Industrial Pictures Ltd. photo.*

Beetroot, which is fairly easy to grow, is a good source of vitamins A, B, and $B_2$. Although it can be stored, it is best when used young.

Cultivation after the plants are up must be sufficient to keep the surface loose and weeds suppressed. Autumn-sown beet may be left in the ground and harvested as required up to September, but after that the seed head will begin to appear and the bulb becomes tough and stringy.

**Quick-maturing varieties** which are recommended are Derwent Globe, Turnip Rooted, and Obelisk.

## Carrots

In northern districts where the growing period extends well into the autumn carrots may still be sown and will produce young, succulent roots for use in early spring. To secure good germination the seed-bed should be carefully prepared and the soil worked to a fine tilth. Light friable loams are desirable for growing autumn-sown carrots and where possible the crop should follow one which has been heavily manured. When it is necessary to use fertilisers a mixture containing 2 parts of sulphate of ammonia to 8 parts of superphosphate (by weight) sown at the rate of 3oz. a square yard will be beneficial, and if dry wood ashes are available, they may be broadcast over the area at the rate of ½lb. a square yard and raked in before sowing the seed. The seed should be sown thinly from ¼in. deep in heavy soils to ½in. deep in light soils, in rows 12in. apart. When sown at this period of the year carrots seldom grow to their full size and in thinning plants may be left twice as thick as for a main crop—about 1½ to 2in. apart. A ¼oz. of seed is sufficient to sow about 100ft. of row.

**Recommended varieties** for autumn sowing are Earlykrop, Chantenay, Early Horn, and Scarlet Horn.

## Cauliflower

To ensure a supply of cauliflower for harvesting in August and September plants should be set out in March and April. Cauliflowers are more sensitive to adverse weather than cabbage or broccoli and it is essential for success that the most suitable varieties be planted.

Cauliflowers grow well in most well-drained soils, provided there is plenty of plant food and moisture. Cultivation before planting should be deep and a liberal quantity of well-rotted organic manure should have been incorporated in the soil or a complete fertiliser added. For most soils this may be composed of a mixture of blood and bone 3 parts, superphosphate 1 part, and sulphate or muriate of potash ¼ part (all by weight), applied at the rate of 4 to 8oz. a square yard. On soils inclined to remain wet in winter good results can be obtained if the fertiliser mixture is sown in a band 6in. wide and the soil drawn up over it to form a ridge or mould 6in. high, 15in. wide at the base, and with a flat top.

*[Sparrow Industrial Pictures Ltd. photo.*

Drumhead varieties of cabbage require plenty of room for best development.

# THE HOME GARDEN IN MARCH

[*Sparrow Industrial Pictures Ltd. photo.*

If grown in autumn, celery in the home garden may be blanched by banking up the soil against the plant, leaving only the leaves exposed. However, if the soil is left around plants for too long, the crop is likely to lack the true celery flavour.

Like all the brassica family cauliflowers do not do well on sour or acid soils, and liming may be necessary if the land has not been recently limed. An application of carbonate of lime at the rate of 2 to 4oz. a square yard should be adequate. Plants may be set out when they are about 4 to 6in. high, spacing them 2ft. apart, with the rows 2ft. 6in. apart, care being taken when planting not to double up the tap root and to firm the soil around the plant. As the plants grow the soil should be drawn up around the roots so that eventually they are on ridges. Most cauliflower crops, especially the late-maturing sorts, benefit from a side dressing applied shortly before the curd begins to form; this may be comprised of equal parts of sulphate of ammonia and superphosphate at the rate of 1oz. per plant. The dressing should be lightly hoed in.

**Varieties recommended** for planting in March are Walcheren, Phenomenal (5 and 6 months), and Late Metropole.

## Cabbage

Cabbage plants grown from seed sown in late January or early February will have attained sufficient size (4 to 6in.) for planting out this month, or suitable plants will now be available at nurseries or seedsmen.

The soil conditions and fertiliser mixture recommended for cauliflowers are satisfactory for cabbage production. It is generally of advantage to plant cabbages at this time of the year on ridges, especially if the soil drainage is poor. To develop properly cabbage requires plenty of room; for the larger-growing types such as savoy and drumhead 2½ft. between the rows and 18in. between plants will be sufficient and for the medium-sized varieties, such as Enfield Market and Golden Acre, 2ft. between rows and 15in. between plants.

## Celery

Good crops of celery may be produced from March plantings in districts where the autumn and early-winter conditions are reasonably mild. Although the self-blanching types will grow quite well under favourable conditions and are earlier, the late, hardy winter varieties adapt themselves best to cold weather, are of better quality, and keep in good condition for a longer period. Gilt-edged Golden, which is an early self-blanching type, and Solid White, which is late, may be planted this month according to locality.

The culture of celery was dealt with fully in the November "Journal." At this time of the year raised beds 4ft. 6in. wide are recommended, to secure better drainage.

## Globe Artichokes

The globe artichoke, though not commonly grown by home gardeners in New Zealand, is a highly prized vegetable in Europe, and a few plants are well worth a trial. It is a perennial not unlike a large thistle and may grow as high as 5ft. It is very decorative, with large, fern-like, silvery-coloured leaves, and when in full bloom the flower heads resemble a large purple thistle. The edible portions of the plant are the flower buds, which are harvested while still immature and before they open. The buds may be prepared for use in several ways, the small side buds may be eaten raw or fried, but the main bud is usually boiled and the inner leaves and the fleshy part of the outer leaves eaten like asparagus. Although the plant is resistant to light frosts and the roots survive even lower temperatures, heavy frosts during the growing period will seriously injure the plant and may even kill it.

Globe artichokes may be grown from seed, but unless a good stock is selected this method may be disappointing and for that reason it is preferable to propagate them from suckers of good plants. When the suckers are 9 to 12in. high they should be separated from the parent root with a spade and transplanted in autumn or winter. These plants will produce a flower stalk with several buds the following spring.

[*Sparrow Industrial Pictures Ltd. photo.*

The globe artichoke is a vigorous plant which attains a height of several feet. It has divided leaves about 4ft. long, with large flower heads which, when properly prepared and cooked, make a particularly good dish.

Seed may be sown in a bed in spring and the young seedlings transplanted—they require plenty of room to develop and each plant should be allowed 4ft. each way—to their permanent position during the following autumn. Flower heads fit for use will be produced the next season and should be gathered before the scales open for flowering. The second year there will be a cluster of several plants each with its flower stalk. After 4 to 6 years plants in each clump will have become so crowded that they develop inferior buds, and new plantings should be established from suckers. For best results the sucker shoots that form each spring at the base of the old plants should be thinned out, leaving only the 4 strongest. Artichokes will grow on most well-drained soils and respond to fairly liberal applications of compost, animal manure, or a few handfuls of a mixture containing equal parts by weight of blood and bone and superphosphate and 5 per cent. by weight of sulphate of potash forked lightly in around each plant.

**The most popular variety** is Green Globe, which is sold by most seedsmen.

## Turnips

Although turnips can be grown almost the whole year round provided a judicious selection of varieties is made, they are of much better quality and hold in good condition longer when grown in cooler weather. If growing conditions are good, early varieties of turnips are ready for use in about 45 to 50 days. Turnips are easily grown, but to secure tender, mild-flavoured roots they must be kept growing all the time and not suffer a check, as under slow growing conditions they are apt to become stringy and develop a bitter, pungent taste.

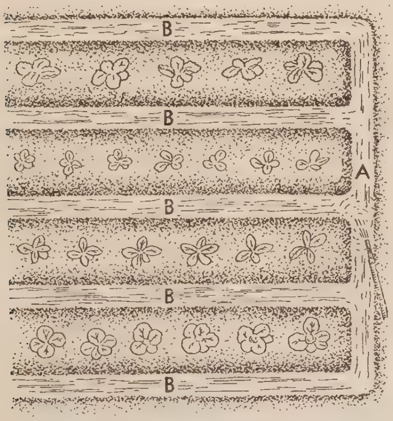


Fig. 1—Furrow irrigation. A—Feed trench, which is level. B—Irrigation trenches, which have a fall of 1in. in 10ft.

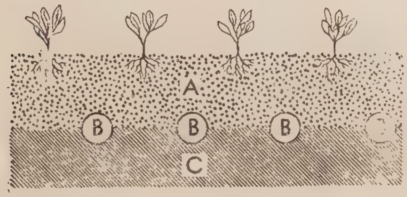


Fig. 2—A cross-section of soil showing the arrangement of the tiles for the underground method of watering. A—Soil. B—Tiles. C—Subsoil.

Land heavily manured for a preceding crop is ideal for turnips and the only additional fertiliser necessary is a dressing of superphosphate at the rate of 2oz. a square yard. Seed should be sown thinly ½in. deep in rows 12in. apart and the plants later thinned to 3in. apart in the rows as soon as they attain the true-leaf stage. Most varieties are white fleshed, but some are yellow fleshed.

**Varieties:** White Stone is the most popular white-fleshed turnip and Orange Jelly (Golden Ball) the most favoured yellow-fleshed variety.

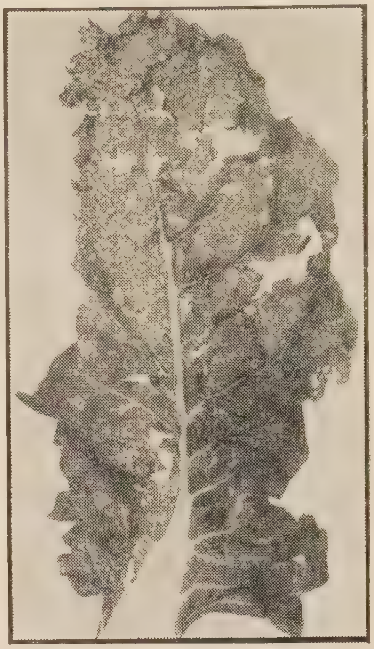
## Irrigation

There are few districts which enjoy such a well-distributed rainfall that watering is unnecessary at least for some parts of the gardening season. A common fault when applying water is to apply little and often; the effect is to bring the roots of the plants nearer the surface and on hot days between waterings, when the topsoil is dry and hot, roots suffer unduly and plants wilt.

**A thorough watering once a week is far more effective than several lighter waterings. After each watering hoe the soil lightly to prevent the surface caking and cracking.**

The most common method of applying water is with a garden hose and to a less extent with a watering can. Where soil conditions are suitable and the garden is on the flat or has only a very gentle slope furrow irrigation will be found satisfactory. Small irrigation furrows beside the plant rows are used to distribute the water, and are very effective when the rows and the furrows are arranged to slope slightly. The furrows may be made with the corner of a hoe, and the water is admitted from the end of a pipe or hose at the highest point and allowed to flow the full length of the furrow (Fig. 1). The advantage of this method is that all the water is applied at the roots of the plants and little is lost through evaporation. It is important to adjust the size of the furrows and the water streams according to the type of soil and the slope and length of row. For sandy soils rather wide, shallow furrows, wetted quickly one by one with a good stream of water, serve well. For heavy soils that tend to bake narrow, deeper furrows irrigated with slow trickling streams are preferable. In the latter case many small streams may be run simultaneously. Often the whole garden may be irrigated by one method as quickly as by the other and with the same water supply.

A further method which has been used overseas by market gardeners for watering is the underground method (Fig. 2). For this method ordinary tile drain pipes are laid under the ground after it has been dug and before the crops have been planted. One end of the pipe system is brought to the surface and the water is poured into the open end. This method has been tried in New Zealand on a small scale only and it is probably suitable for only certain types of soils. Loose subsoils or those that would allow too-rapid drainage would not be suitable.



[*W. E. Barnard photo.*

Heavy infection of leaf spot (*Cercospora beticola*) on silver beet leaf.

For those who like to try something new and who are prepared to meet the cost of the pipes the following description of the system is given: Lines of tiles are laid down 3ft. apart and 12in. below the surface. By connecting the lines of tiles at one end by means of another row of tiles at right angles to them water may be discharged into the system at one point from a hose and will find its way to all parts, entering the soil through the openings between the tiles.

## Control of Pests and Diseases

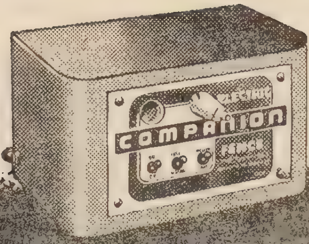
A section on control of pests and diseases in the home garden was begun in the December "Journal" and continued in the January issue. Other troubles and the methods of combating them are discussed in the following section of this month's notes.

### Beetroot, Silver Beet, Spinach

**Leaf spot:** There are several fungi which cause severe leaf spotting of beetroot, silver beet, and spinach, and which may retard the growth of the plant or render the edible leaves unfit for use. The trouble is usually more severe in cold, wet weather.

**Treatment:** Bordeaux mixture, 4oz. of bluestone and 5¼oz. of hydrated lime in 4 gallons of water, or a copper oxychloride spray will give good control. More than one application may be necessary.

**Rust** (*Uromyces betae*): This is fairly common, especially on red beet, appearing as yellowish-brown pustules on the leaf surface. Rust is only likely to thrive on the foliage of plants which



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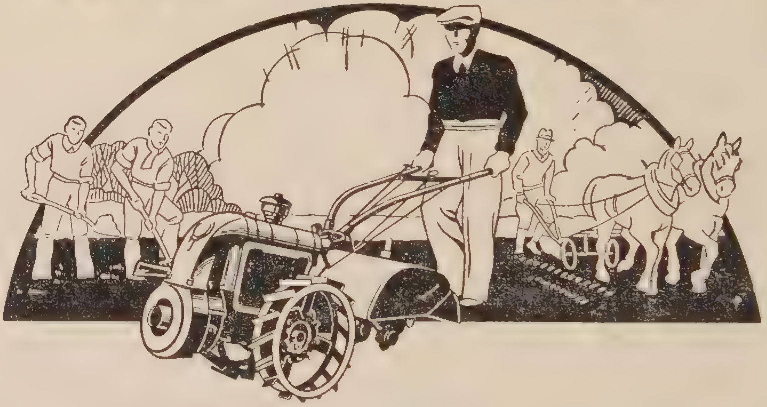

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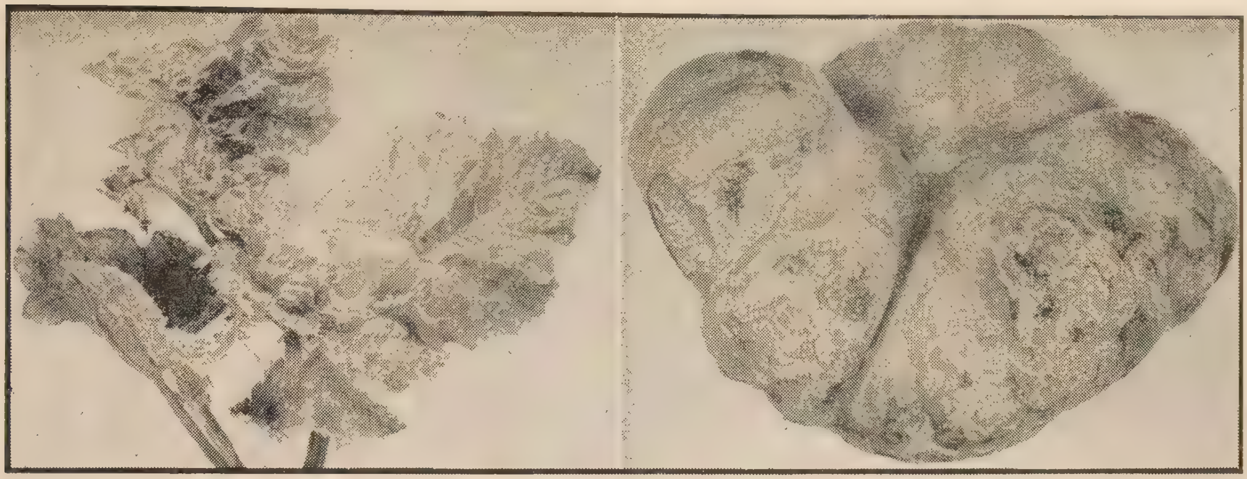


[*Photo at right by M. Dahlberg.*

Left—Portion of a marrow vine infected with cucumber mosaic. Right—The fungus *Mycosphaerella citrullina* on a pumpkin.

have received excessive amounts of nitrogenous manures or are short of potash.

**Treatment:** The removal of infected leaves as soon as they are noticed is usually sufficient to check rust. If the disease persists, Bordeaux mixture should be applied as recommended for leaf spot.

**Cucumbers, Marrow, Pumpkin, Squash**

**Powdery mildew** (*Erysiphe cichoracearum*): This is fairly common on cucurbits, especially cucumbers, but seldom causes heavy losses. It appears first as small, greyish spots which later become covered with white powder. In severe attacks the whole plant assumes a white, mealy appearance.

**Downy mildew** (*Peronoplasmopara cubensis*): This disease also attacks cucurbits. It appears as more or less angular, yellowish spots on the leaves, on the undersides of which a scanty white downy growth develops. This downy growth is not always visible to the naked eye. The individual spots are rarely more than ½in. in diameter, but they may later coalesce and result in the death of the whole leaf.

**Treatment:** Powdery mildew and downy mildew can be controlled by spraying the plants every 10 days with Bordeaux mixture, 4oz. of bluestone and 5¼oz. of hydrated lime in 4 gallons of water, or copper oxychloride spray.

*Mycosphaerella citrullina*: This fungus attacks pumpkins, water melons, and citron melons. It affects fruits in storage mainly, but does occur in the field on the stems and leaves of plants; fruits become infected from this source. It appears on the leaves and stems as light brown spots bearing minute black fruiting bodies. The fruit rot begins as water-soaked or greyish areas on the rind and this gradually becomes dark brown to black. Only a small portion of the rind may be affected or in severe cases infection may occur over a large portion of the fruit. The flesh remains firm, but is usually attacked by secondary organisms which cause a soft rot. Large numbers of small black fruiting bodies are present on the affected areas. Where the disease is troublesome plants should be sprayed with Bordeaux mixture, 4oz. of bluestone and 5¼oz. of hydrated lime in 4 gallons of water, particularly just before harvesting the crop.

**Root rot or canker** (*Bacterium carotovorum*): This is quite common on cucumbers and is sometimes troublesome on other cucurbits. It attacks young and older plants alike, causing a soft rot at the base of the stem. The trouble is encouraged by wet conditions at the stem base, and if left unchecked, will penetrate the tissues and kill the plant.

**Treatment:** Plants should be set out on small mounds so that water will not lie around the base of the stems. When the trouble is seen and is not far advanced it can be checked by coating affected parts with a powder made of 3 parts of flowers of sulphur, 3 parts of finely powdered bluestone, and 10 parts of hydrated lime.

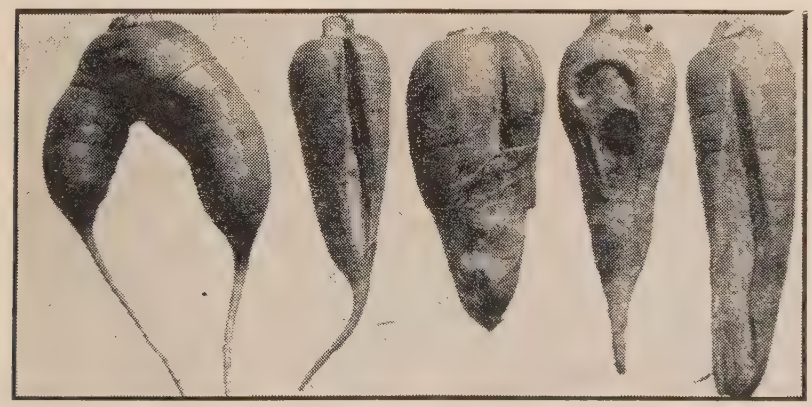
**Cucumber mosaic:** This is a virus disease which may cause serious losses in cucumbers, marrows, pumpkins, and squashes. Symptoms consist of stunting of the plants and mosaic mottling of the foliage, the symptoms being accompanied in cucumbers by a mottling and distortion of the fruit.

**Treatment:** As the disease is seed borne, care should be taken to save only seed from disease-free plants. Healthy plants should not be touched after handling diseased ones. Thorough washing of the hands with soap and water after handling diseased plants and before working among healthy ones is necessary. Affected plants should be removed and destroyed.

**Aphides (plant lice):** The young leaves of cucurbits are sometimes caused to curl by the attacks of colonies of these insects, which extract the sap from the foliage and in severe cases will cause it to wither and die.

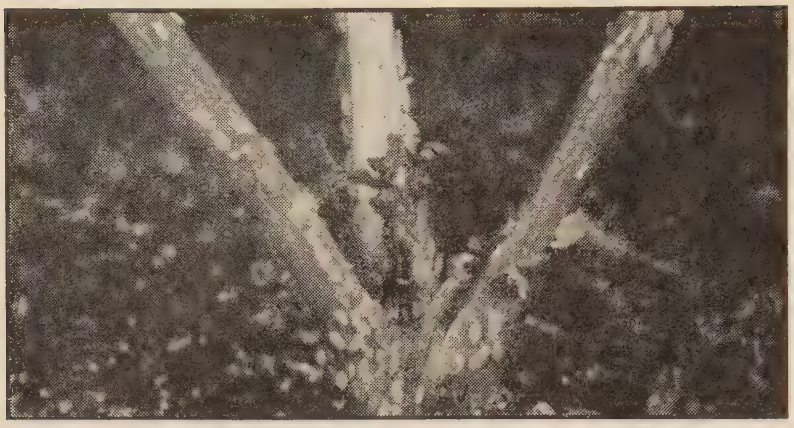
**Treatment:** One or two applications of nicotine sulphate, 1fl. oz. (7 teaspoons) in 4 gallons of water to which 2oz. of soft soap has been added, should give satisfactory control.

**Springtails** (*Collembola*): These minute, wingless, yellow, brown or black globular insects about the size



[*Sparrow Industrial Pictures Ltd. photo.*

The splitting of carrots is a common trouble, especially if they are grown in dry soil conditions or where heavy applications of nitrogenous fertilisers have been made.



[*M. Dahlberg photo.*

Base of carrot showing infestation by aphides (enlarged).

of a small pin head eat tiny round holes in the leaves of young plants, and severe attacks will seriously restrict growth. When disturbed the insects jump rapidly into the air.

**Treatment:** One or two applications of nicotine sulphate spray as recommended for aphis or 50 per cent. D.D.T. wettable powder, ½oz. in 4 gallons of water, or dusting of plants with a 2 per cent. D.D.T. dust should give control.

### Carrots

**Splitting:** With the exception of insect damage most troubles with carrots occur in stored roots. However, splitting of the root may occur in the field. It is not caused by disease, but is a physiological trouble. In some seasons nearly all the roots in a crop may split, especially if they have been grown under hot, dry conditions, so that when rain comes the rapid growth causes the prematurely hardened outer layer to crack. Subsequent growth will increase the split both in length and depth. Heavy applications of nitrogenous fertilisers may also induce splitting. A balanced fertiliser containing a high percentage of phosphate and potash should be used, and the crop watered during dry weather.

**Rust fly** (*Psila rosae*): This is a boring insect which is a serious pest of carrots in the Auckland district. The damage is caused particularly during dry seasons by the maggots of the fly attacking the roots and boring small rust-coloured tunnels through the roots. They may be so extensive as to cause stunting of the foliage, which may turn red and finally yellow. The rust fly, a 2-winged, shining black yellow-legged fly about 1/6in. long, appears mainly in spring and lays its eggs in the soil close to young carrot roots. On hatching, the legless maggots enter the lower end of the root, working upward as they destroy the tissues.

**Treatment:** All carrots showing signs of attack should be removed and destroyed, to avoid a possible build up of the pest in the soil. As a protective measure, rows of young carrots should be dressed with a repellant such as naphthalene, broadcast at 14- to 21-day intervals over the area at the rate of 1oz. a square yard. Applications should cease at least 2 weeks before carrots are to be used, as there may be some residual taint of naphthalene after cooking if the repellant is employed up to a later stage. Another method which has been found successful and is worth a trial is to water the carrot rows every 4 weeks with a solution of 1oz. of 50 per cent. D.D.T. wettable powder in 4 gallons of water. This is applied over the carrot foliage with a watering can with a fairly fine rose and allowed to wet the top inch of soil. Applications should begin as soon as plants have reached the true-leaf stage and should cease as soon as they have grown to a usable size.

**Aphis** (*Cavariella aegopodii*): Commonly called plant lice, these aphides are small, globular, green or yellow green, and may be wingless or have 4 transparent wings. They suck the sap, and growth usually becomes stunted; severe attacks may cause the plant to wilt and die. Tiny white specks, which are the cast skins of the aphides, may be present on the foliage and the foliage may become bronze, bluish, or reddish, and the leaves and petioles become distorted.

**Treatment:** In dry weather a careful watch should be kept for aphides and at their first appearance plants should be sprayed with nicotine sulphate, 1 fl. oz. (7 teaspoons) in 4 gallons of water to which 2oz. of soap or soap powder has been added.

### Acknowledgment

Acknowledgment is made to the Plant Diseases Division of the Department of Scientific and Industrial Research for assistance in the preparation of the section dealing with diseases and their control and for supplying the photographs included in this section.

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# Fruit Crop Estimates for December, 1949

THE following estimates of the fruit crop for December, 1949, in 000's of bushel cases, are provisional and revised monthly for the period November to March and are summarised from information supplied by field officers of the Horticulture Division, Department of Agriculture.

| FRUIT | DISTRICT | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Auckland | Gisborne | Hawkes Bay | Manawatu Wanganui | Wairarapa | Nelson | Marlborough | Canterbury North Otago | Central Otago | Total |
| APPLES— | | | | | | | | | | |
| Ballarat | 57 | 10 | 90 | 1 | 2 | 5 | 2 | 7 | — | 174 |
| Cox's Orange Pippin | 8 | 4 | 83 | 1 | 1 | 116 | 13 | 17 | 3 | 246 |
| Delicious | 38 | 11 | 110 | 1 | 5 | 180 | 14 | 18 | 19 | 396 |
| Dougherty | 21 | 5 | 70 | — | — | 24 | 1 | — | — | 121 |
| Granny Smith | 69 | 3 | 85 | 2 | 2 | 68 | 1 | 2 | 1 | 233 |
| Gravenstein | 26 | — | 35 | — | — | 43 | 1 | — | — | 105 |
| Jonathan | 11 | — | 50 | — | 1 | 249 | 20 | 12 | 3 | 346 |
| Sturmer | 6 | 5 | 200 | 5 | 15 | 325 | 22 | 49 | 11 | 638 |
| Other varieties | 103 | 6 | 166 | 3 | 5 | 135 | 11 | 51 | 15 | 495 |
| Total | 339 | 44 | 889 | 13 | 31 | 1145 | 85 | 156 | 52 | 2754 |
| PEARS— | | | | | | | | | | |
| Beurre Bosc | 3 | — | 2 | — | — | 5 | — | — | — | 10 |
| Louise Bonne de Jersey | — | — | 10 | — | — | — | — | — | — | 10 |
| Packham's Triumph | 6 | — | 3 | — | — | 1 | — | — | — | 10 |
| P. Barry | 2 | 1 | 8 | — | — | 2 | — | — | — | 13 |
| W. B. Chretien | 10 | — | 40 | — | — | 17 | — | 2 | 8 | 77 |
| Winter Cole | 1 | 1 | 30 | — | 1 | 31 | 1 | 7 | 2 | 74 |
| Winter Nelis | — | 1 | 30 | — | — | 7 | — | 2 | 5 | 45 |
| Other varieties | 13 | 1 | 8 | 1 | — | 8 | — | 5 | 2 | 38 |
| Total | 35 | 4 | 131 | 1 | 1 | 71 | 1 | 16 | 17 | 277 |
| OTHER FRUITS— | | | | | | | | | | |
| Peaches | 60 | 6 | 166 | — | — | 32 | — | 4 | 45 | 313 |
| Apricots | 1 | — | 4 | — | — | — | — | 5 | 69 | 79 |
| Nectarines | 1 | — | 14 | — | — | 1 | — | — | 9 | 25 |
| Plums | 33 | 5 | 32 | 1 | — | 3 | — | 3 | 20 | 97 |
| Cherries | — | — | 1 | — | — | — | 1 | 3 | 10 | 15 |
| Quinces | 9 | — | 9 | — | — | 4 | — | — | — | 22 |

# LETTUCE MOSAIC

By P. R. FRY, Plant Diseases Division,
Department of Scientific and Industrial Research.

ALTHOUGH lettuce mosaic was recorded in the United States of America in 1921, it was not until 1946 that this virus disease was observed in New Zealand. Surveys of 37 commercial crops in Auckland, Palmerston North, Levin, the Hutt Valley, and Christchurch showed that the incidence of infection varied from a trace to 100 per cent. and averaged 25 per cent. Severity of infection varied between plants because they had become infected at different stages of growth. Experiments have since shown that plants which become infected as seedlings attain only half the weight of healthy plants and only a small percentage form compact hearts. Infection at later stages of growth is not so serious, but considerable losses still occur.

ON young plants in seed-beds symptoms occur as light blotches on the first leaves (Fig. 1). On older plants the disease is characterised by lightening in colour along the veins (Fig. 2), puckering of the leaf surface, and marked serration of leaf margins. These symptoms are sometimes replaced by an irregular pattern of light and dark green (Fig. 3) which is especially pronounced on leaves of flower stalks. Infected plants are usually stunted, pale, and often fail to heart satisfactorily, sometimes forming loose rosettes (Fig. 4).

## Methods of Spread

Lettuce mosaic is seed carried and is spread in the field by aphides (greenflies). Tests have shown that the disease is carried by 6 to 15 per cent. of seed saved from infected plants and that 2 to 3 per cent. infected seed often occurs in commercial lines. The aphides which commonly infest lettuce in New Zealand are able to carry infection; when they are numerous in a crop all plants may eventually become infected even though only a few diseased plants were present initially.

A number of plant species are susceptible to the disease. Two of them, groundsel and prickly sow thistle, are likely to play a part in the spread of infection, as they are common in lettuce crops and frequently harbour aphides.

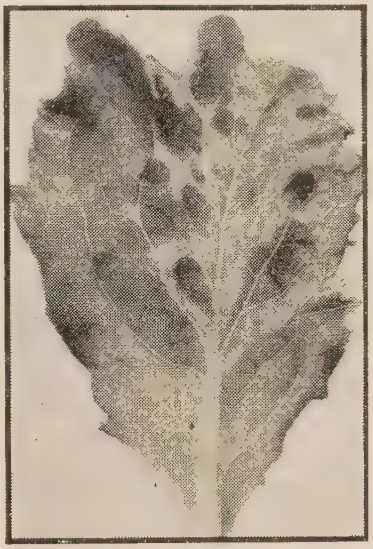


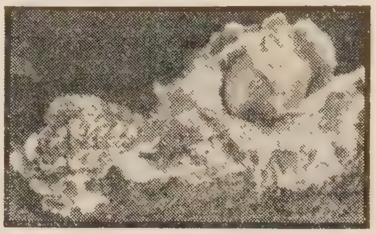
Fig. 1—Leaf of Imperial 847 lettuce showing light-coloured areas. Natural size.

## Control Measures

**Use of disease-free seed:** Since all available seed is imported, there is at present no method of ensuring its freedom from disease.

**Destruction of infected seedlings:** The disease is usually introduced into crops with infected seedlings, the number of which can be greatly reduced by destruction, when transplanting or thinning, of all seedlings showing characteristic light-coloured mottling.

**Dipping seedlings in nicotine-soap solution:** As lettuce mosaic is carried by aphides, spread of infection can be reduced by destroying aphides before setting plants out in the field. This can be done by dipping plants in a solution of nicotine sulphate and soft soap (1oz. of nicotine sulphate and 2½oz. of soft soap to every 5 gallons of water). Spraying of lettuce plants in the field is unlikely to give economic disease control.



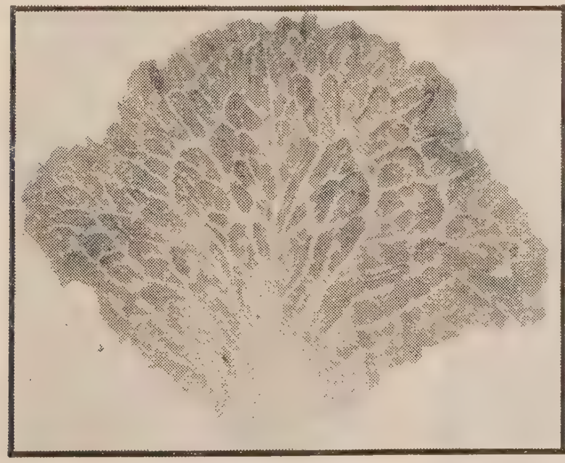
[*S. A. Rumsey photo.*

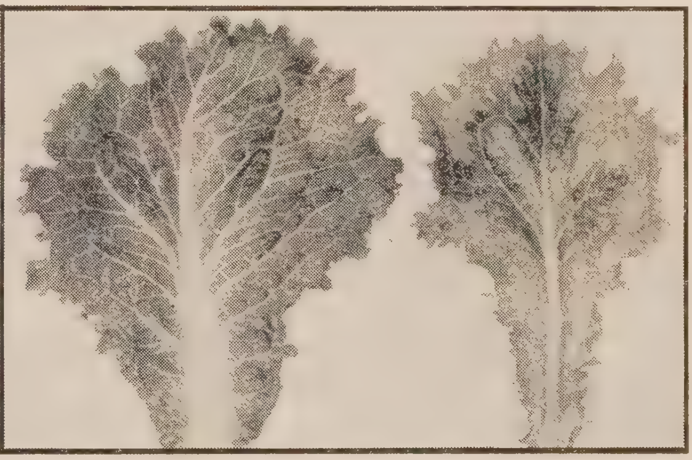
Fig. 4—Comparison of healthy and infected Imperial 615 lettuce.

**Removal of infected plants from the field:** Frequent inspection of the crop during the first four to five weeks and destruction of infected plants will limit spread of the disease.

**Weed eradication:** Regular destruction of weeds, both in rows and headlands, reduces the number of aphides and eliminates susceptible weeds, which are a possible source of infection.

**Prompt destruction of unmarketable plants after cutting:** Plants which have failed to heart may be infected with lettuce mosaic and carry the disease over to later crops if not destroyed promptly by discing or, preferably, ploughing in.





[*Photo at right by S. A. Rumsey.*

Fig. 2 (left)—Vein clearing on leaf of Imperial 615 lettuce naturally infected with lettuce mosaic, 1/3 natural size. Fig. 3 (right)—Comparison of leaves of healthy and infected Great Lakes lettuce, showing light- and dark-green mottle, 4/5 natural size.

# REQUEENING OF HIVES

## Seasonal Notes for the Domestic Beekeeper

**EVERY domestic beekeeper should strive to improve his bee stocks by careful selective breeding. The importance of requeening and methods of performing the work are dealt with in this article by R. Goddard, Apiary Instructor, Department of Agriculture, Tauranga.**

IN northern parts of New Zealand where mild climatic conditions are experienced and the queen lays throughout the year it is essential to requeen annually, but in places where conditions are cooler and there is a cessation of brood rearing in winter it is sometimes possible to allow the queen to carry through another season. However, to ensure an abundance of field bees at the beginning of the main honey flow and to keep swarming of colonies to an absolute minimum domestic beekeepers are advised to requeen their hives each season.

Experience has proved that the Italian bee, which is recognised by the three distinct yellow markings bordered with black on the abdomen, is best suited to New Zealand's climatic conditions. These bees are easy to handle, quiet on the combs, good workers, and not inclined to excessive swarming. These characteristics vary slightly in each hive and it is essential, therefore, when preparing to breed queens to choose a hive which has outstanding qualities.

If the domestic beekeeper has hybrid or black bees in the apiary, it is advisable to requeen all colonies with good Italian queens purchased from some reputable queen breeder. This will ensure that the apiary has pure Italian drones for mating with the virgin queens if the beekeeper desires to do his own requeening in future.

### Finding Black Queens

Usually considerable difficulty is experienced in finding black queens, as they move rapidly over the combs searching for some dark corner when the hive is opened, and it is sometimes necessary to shake all the bees through a queen excluder before the queen is discovered.

To carry out this operation place a queen excluder between two empty supers alongside the colony. Lift out each comb and, after a quick look for the queen, dislodge all adhering bees with a sharp downward motion into the empty super and by judicious use of the smoker drive the bees through the excluder to the super below. It may be necessary to shake all the combs in this manner, and if the queen is not discovered endeavouring to push her way through the excluder, the bottom board and empty supers should be examined carefully.

When the queen has been destroyed and the hive reassembled give the colony sufficient time (2 to 3 hours) to realise that they are without a queen before attempting to introduce a new queen.

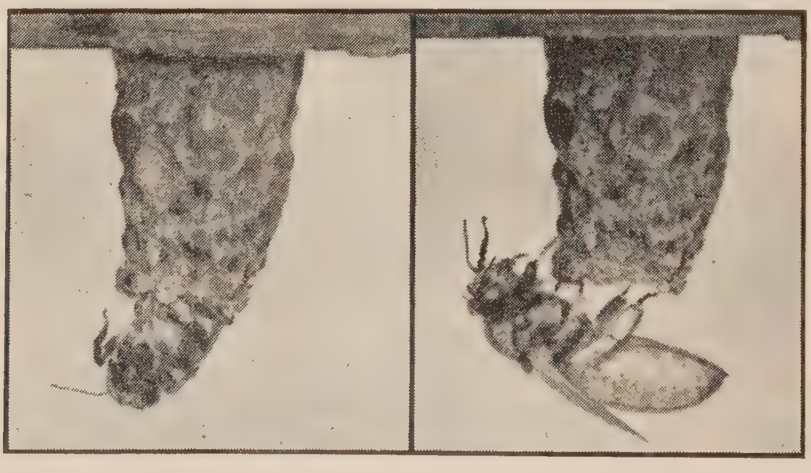
### Queen Rearing

If the domestic beekeeper has no replacements and unfortunately finds a failing queen, it is preferable to kill her and to allow the bees to rear their own queen. Numerous cells are raised by the bees in this manner, but only the largest and best should be kept; the rest should be destroyed by the beekeeper. This method is not recommended and should be used only in an emergency, as the queens raised under this system are usually of an inferior type.

The modified "Alley" system of queen rearing does not require the high skill necessary in other methods. Consequently, this system is recommended for the domestic beekeeper desiring to breed his own queens. The first essential when preparing for queen rearing is to select a colony having the desired characteristics, such as good workers, quiet bees, etc., for breeding purposes. When this colony has been chosen place a newly drawn comb into the centre of the brood nest and in a few days the combs should contain eggs and young larvae suitable for queen rearing. This comb can then be removed and, after a sharp knife has been used to cut away the lower edges, it can be placed in a colony strong in nurse bees from which the queen and brood have been removed. It is essential, however, that this prepared colony should have ample supplies of both pollen and honey if it is desired to raise good queens. If there is no nectar flow, artificial feeding of the colony should be resorted to.

If conditions are favourable for queen rearing, a number of ripe queen cells should be ready in 9 or 10 days. The comb in the cell-raising colony should be removed carefully and the queen cells gently cut out with a sharp knife. Particular care should be taken when handling these ripe cells, as the young queens are easily damaged at this stage of their life. Each queenless colony should be given one of these ripe cells attached to a frame of brood and placed in the centre of the brood nest. If there is a dearth of nectar at this time, feed sugar syrup to all colonies before the introduction of queen cells. Check the hive in a few days to ensure that the virgin queen has hatched out and been accepted by the bees.

Requeening of hives and the rearing and introduction of queens are too big a subject to be covered fully in these notes, and the domestic beekeeper desirous of further information is advised to buy the Department's Bulletin 267, "Beekeeping in New Zealand," which is available from any office of the Department of Agriculture for 2s. 6d.



Left—The birth of a queen. Right—A virgin queen immediately after hatching from a cell.

REGISTRATION OF

## DAIRY FACTORY MANAGERS

**Intending applicants are hereby notified that applications for registration under the Dairy Factory Managers' Regulations should reach the Registrar, Dairy Factory Managers' Registration Board, c/o Department of Agriculture, P.O. Box 3004, Wellington, on or before April 1, 1950. Forms are available from the Registrar.**

**Attention is drawn to the fact that any application which is received by the Board after April 1, 1950, shall not, except in special circumstances, be considered by the Board until after April 1, 1951.**

E. M. EDGECOMBE,
*Registrar.*

N.B.—*This notice refers to persons who are NOT AT PRESENT HOLDERS OF CERTIFICATES. Notice of renewal and renewal form will be posted to every registered manager by the Registrar.*

# Production of Wholesome Milk for Town Requirements

By T. A. COULTER, Supervising Dairy Inspector,
Department of Agriculture, Christchurch.

**THE production of milk for town requirements is a highly specialised industry. Town milk has been defined as "the whole of the normal secretion from the normal udder of a healthy cow, uncontaminated by extraneous influences" and is required by law to conform to a standard of not less than 3.25 per cent. butterfat and 8.50 per cent. solids other than fat. Various aspects of town milk production are described in this article, the concluding portion of which will appear in next month's "Journal".**

MILK is the nearest approach to the perfect food; it contains practically all that is required for growth and the maintenance of life and it is a protective food. No food, of course, is perfect in the sense that it can supply all that is required by the body all the time. For instance, a newly born baby is born with a good store of iron in its body, as the milk provided for its needs is not rich in iron.

Milk is, however, perfect in the sense that it provides for all needs at times and most needs at all times. As a protective food it enables the body to counteract the harmful effects of pathogenic organisms. Unlike other products milk is all usable, so there is no waste; it blends well with other foods and may be used in a variety of ways; and it is a wholesome, safe food when it has been produced and handled under hygienic conditions and according to certain approved techniques. For the adult it is the best of all foods; for the child it works miracles.

New Zealand still has to learn the value of milk. The consumption of milk in homes is so low—approximately half a pint per head per day—that it must have a marked effect on the health of the people. Many regard milk as a baby food and others believe it produces superfluous fat.

**If the people are to be encouraged to drink more milk, it is the responsibility of the milk producer, particularly, to provide wholesome milk and not a poor and dangerous substitute.**

Regulations provide that the bacterial condition of milk shall be such that when submitted to the reductase test it shall not completely decolorise methylene blue in less than 4 hours. The milk must be subjected to the test not later than 6 hours after the sample is taken by an inspector, and immediately after being taken and until delivered to the analyst the sample must be kept in an ice box.

In New Zealand statutory authority governing the production and sale of milk was enacted under the Dairy Industry Act, 1898, and subsequent Regulations now in force prescribe particulars relating to the supervision of the production and sale of milk for human consumption. The Livestock Division is charged with the responsibility of administering these Regulations, and as a consequence specialist officers of the Division are authorised to register dairies for town milk production.

Before 1898 dairy inspection for the milk supply for local consumption was under the control of local authorities.

## Many Changes

In the comparatively short space of 50 years the town milk industry has experienced many changes. In earlier days practically all milk was produced by farms close to the towns on which cows were milked by hand, and the milk was distributed by the farmers. As towns grew it became necessary to go further afield for milk, which created difficulties in transport and distribution, problems which increased with the years.

The lack of organisation in the industry made the position of the milk producers so difficult that finally at

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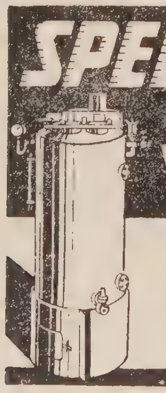

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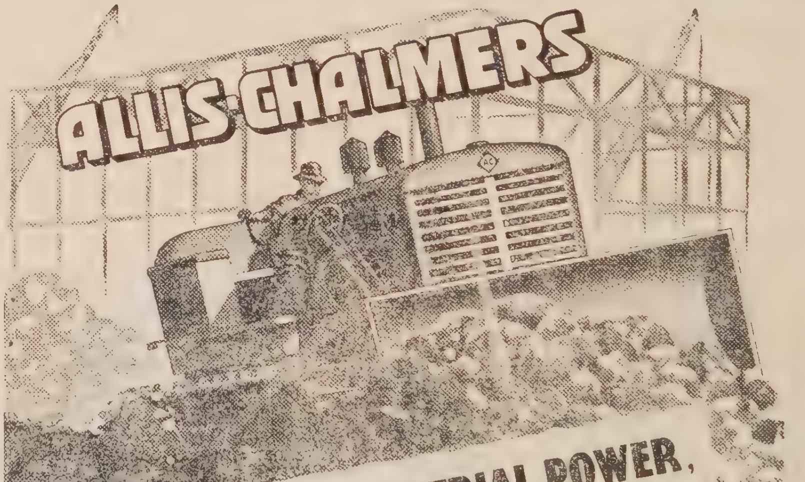

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their request the Government in 1943 set up a Royal Commission to inquire into the milk supply conditions in the four metropolitan centres and to recommend improvements considered necessary to place the industry in a stable position. Among other things, the Commission recommended payment to ensure:—

Adequate supplies of milk of high standard from healthy cows.

That milk should be produced under the best possible conditions of hygiene in the milking shed.

That the milk should be cooled rapidly after milking and held before collection at a temperature sufficiently low to inhibit the growth of any harmful organisms.

That milk should be collected from the farm dairy and conveyed to the processing plant or distributing centre as soon as possible after milking.

That milk should be properly processed in order to ensure the destruction of any harmful organisms.

That after processing it should be distributed as quickly as possible to the consumer under conditions of maximum safety and hygiene.

The first three recommendations apply essentially to the producer.

On town milk supply farms ample supplies of suitable food must be provided during the colder months of the year. The illustration shows lucerne hay being loaded for feeding out.

## Milk Act, 1944

As a result of the recommendations of the Milk Commission, the Milk Act, 1944 was introduced and received the full support of Parliament and milk producers. The new legislation heralded a new era for the town milk industry which is already an established fact.

Farmers now have an organisation based on: The Town Milk Producers' Federation (central executive), milk producers' associations (throughout New Zealand), and supply association. (Where there is more than one approved milk producers' association in a milk district representatives from each form a committee of supply, which arranges with the local milk authority to supply all the milk for that district.) In addition in many districts milk producers' associations are represented on the milk corporation which controls the treating house.

On town milk dairy farms a high standard of production, based on cleanliness, is insisted on. In this, officers of the Livestock Division have throughout the years built up such good will that they have won the confidence of producers and enjoy their whole-hearted support and encouragement in the task of improving the quality of the milk supply.

Those dairy farmers engaged in this exacting calling need to be expert in their complex duties: Cows must be brought into profit in the autumn, ample supplies of suitable food must be provided during the colder months of the year so that the milk supply is maintained at an even level, and constant vigilance and attention is necessary to keep herds free from disease.

Good, well-kept shelter belts of macrocarpa 29 years old on a town milk supply farm.

## War Against Bacteria

A constant war must be waged against contaminating bacteria, because if these organisms get into the milk, they give rise to souring and tainting, thus impairing the keeping qualities. Bacteria are found in the air, in the ground, in both dry and wet manure, in hay, on stools, door handles, milking machines, and on all other dairy utensils and equipment.

Even if suitable precautions have been taken at a milking, bacteria will be present in varying numbers by the next milking and every utensil coming in contact with the milk adds a quota of these organisms to the milk. Under practical working conditions it is impossible to keep milk entirely free from bacteria, but special techniques have been evolved to reduce the numbers getting into it to a minimum and to retard their growth or to destroy those already in the milk.

This article deals only with the production of milk on the farm and not with its treatment after it leaves the farm.

**It cannot be emphasised too strongly that, irrespective of what happens later, whether the milk is to be sold as raw or is to be pasteurised, it is the responsibility of the milk producer to ensure, as far as is humanly possible, that only milk of the highest quality leaves the farm. Nothing that is done at any later stage in its life can improve its quality.**

# PRODUCTION OF WHOLESOME MILK FOR TOWN REQUIREMENTS

Feeding shed for housing dairy cows in winter. Left—Exterior view; note the ridge and louvre ventilation. Right—Interior, showing drainage provided on each side, feeding racks, and division posts of used railway lines. The shed, which is 80ft. long and 42ft. wide, houses 44 cows.

In shouldering responsibility for the supply of only clean and wholesome milk Inspectors of the Livestock Division are one with the farmers. Town milk producers generally are jealous of their trust; dairymen do not want to sell milk which is inferior in any way, and dairymen's associations throughout the country will discipline any milk producer who will not co-operate and conform to the high standard of production laid down for town supply.

It has always been the policy of the Livestock Division to obtain results by inspection combined with instruction. The effect of this policy is evident throughout New Zealand. Little difficulty has been experienced in improving the standard of town supply dairies so that today there are many modern, well-designed dairy premises with clean surroundings.

In many centres all milk is already tested for quality every day; in others this desirable state is being reached as rapidly as circumstances permit.

Regulations provide that milk must show a reductase test result of 4 hours (and milk as it is delivered to the consumer should comply with this standard). However, with the exception of localities where high humidity or the lack of really cold water for cooling milk are influencing factors, it is customary to operate on an unofficial reduction time of 6 hours for milk kept at ordinary atmospheric temperature for at least 15 hours and sometimes longer. Farmers who produce milk under conditions which will be explained later experience no difficulty whatever in reaching and maintaining this standard. In fact, very large quantities of milk, even in hot summer weather, give a reduction time of 8 hours and longer. These standards apply also to cream for town supply.

## Co-operation Essential

Advisory officers cannot assist farmers to reach and maintain the creditable standards mentioned without full co-operation; if one dairy farmer continually falls short and does not respond to the instruction always available, there is no room in the milk producers' association for him. He is given every encouragement to improve, but if, as rarely happens, he cannot or will not reach the standard, his milk cannot be accepted for town supply. The attitude of town milk producers' associations is that the milk supply on leaving the farm must be beyond reproach, and that the reputation of efficient producers should not be prejudiced by the actions of inefficient producers.

As all the milk for a milk district must be sold through a milk producers' association, a new producer must join an association before he is permitted to sell milk in a milk district. The Livestock Division will register the dairy premises if they comply with the Dairy (Milk Supply) Regulations, 1939, but it is the practice to advise the producer to contact the milk producers' association first to ascertain if his milk will be required.

A new town supply milk producer receives close attention, as he is entering a branch of the dairy industry in which there are many pitfalls for those who have not had practical experience. The fact that the standard of production must be high, because consumers are entitled to the best milk, is emphasised. Only good producers have a place in the industry and Dairy Inspectors are prepared to give such producers every assistance to solve problems and so avoid disappointments and mistakes. By using common sense and following a regular routine, any farmer can produce milk of the required standard. Town milk producers very seldom deregister their dairies because the demands in regard to standards are too exacting.

To become a successful town milk producer whose milk or cream is always included in the list of high-testing suppliers a farmer must give attention to many details.

## The Farm

As milk has to be produced all the year round, it is important for a supplier of milk to have land where production can be maintained in winter. The writer has seen farmers endeavouring to produce milk on land which at times in winter has been almost turned into a lake. These ventures invariably have ended in complete failure. On this class of country, too, the flavour and quality of milk frequently suffer by comparison with that from better-class, drier land, and dairy cows require more attention owing to the wet, cold conditions usually found. Of course, some localities are more favoured than others in respect to suitable land for all-the-year dairying, and it is frequently necessary to make the most of what is available. Good shelter and dry land for camping and feeding out are definite advantages. In districts where the climate or the nature of the land warrants it cows are sometimes stalled overnight or fed in sheds and later turned out in sheltered paddocks.

The cheapest and best milk-producing food is good pasture and New Zealand is favoured in this regard. Unfortunately, however, in most parts of the country there are vast areas of run-out pasture, which cannot compare with good pastures for the production of milk, and farmers who make a practice of resowing part of their farms when necessary reap the benefit in carrying more and better cows. Hay from good pastures is of better quality, too. Sometimes large paddocks of inferior grasses are cut year after year for hay. The feeding value of such hay is negligible, and occasionally it is all the cows get. Farmers cannot expect to get good milk from this class of feeding.

### Supplementary Feed

Now that the town milk supply payment is based on a winter quota it is important to budget for not only the calving of the cows but the growing and conservation of fodder for winter feed. The supplementary food provided will depend on the acreage of the farm; hay and chou moellier, with possibly greenfeed for late autumn, are most suitable for a small property, and on larger holdings, if suitable ground is available, a good lucerne stand is ideal. With larger herds the cutting and feeding out of chou moellier in wet winter weather is an unpleasant task compared with the feeding out of silage.

Silage appears to have taken the place of chou moellier entirely in some instances, but, unfortunately, it does not appear to be practicable to make silage with less than, say, 10 acres of a good crop and for that reason chou moellier is favoured for a small farm. It must be understood that silage or chou moellier is a necessary complement to hay, as hay alone tends to cause impaction and cows do not produce well on hay alone. The cow's motion affords a valuable guide in this respect; with supplementary feeding the aim should be to keep motions soft and free, as a cow with a hard, dry motion is definitely not milking to capacity.

An ideal scheme seems to be the making of silage with the first cut of lucerne, which usually contains weeds and other grasses which are suitable for silage but do not make good hay. Of course the better the material the better the silage. Moreover, the weather is usually unsettled when the first cut of lucerne is ready, but this does not affect the making of silage. Another aspect of making silage with the first cut is that, if a cut is made reasonably early, the second cut, which invariably is a good, clean crop, is available for hay. The third cut is ready 6 weeks after the second, and on good stands there is often a fourth cut, which can be used for silage or may be cut and fed out, depending on the weather. From observation, however, it appears to be wise to feed out a little hay before feeding out green, wilted lucerne to cows, as this prevents indigestion, often so prevalent at this time.

Where no silage is made chou moellier—the green-stalk type of chou moellier seems to yield good feed—or greenfeed is necessary. The farmer often finds difficulty in feeding off ordinary greenfeed such as oats and Italian ryegrass owing to wet weather making the paddocks too soft; for that reason chou moellier is the most reliable form of greenfeed, although it involves more work.

As the food value of chou moellier is spent by early August, in districts where spring growth would not have begun, a small crop of mangolds is a great asset, as supplementary feeding with hay enables pastures which have previously been harrowed to become sufficiently established.

Feeding out silage. Silage or chou moellier is a necessary complement to hay as hay alone tends to cause impaction, and cows do not produce well on hay alone.

It is wise to have sufficient good hay on hand when pastures are making rapid growth in spring so that cows can be given a little each morning before they are turned on to grass. Rotational feeding is the best and soundest method of grazing. Cultivation methods vary, but under Canterbury conditions chou moellier can be grown from lea soil if the run-out grass paddock is skimmed very lightly in late autumn and, if the weather is favourable, disced and grubbed 4 or 5 weeks later. The paddock is then left until August, when it can be ploughed and left to become mellow. Light top work will then prepare a good seed-bed ready for the seed to be drilled in about the end of October.

Clean drinking-water trough serving three paddocks.

A sound procedure with lea soil appears to be to sow it down in chou moellier, follow this with a crop of potatoes, if required, or mangolds, and then grass it down. Mangolds may be grown in the same manner as chou moellier and also sown at the end of October when the ground is warm and mellow.

The paddock being grassed down in early autumn, whether with oats or not, can be cut for a crop of hay in early November and there is then good growth the following autumn.

## Water Supply

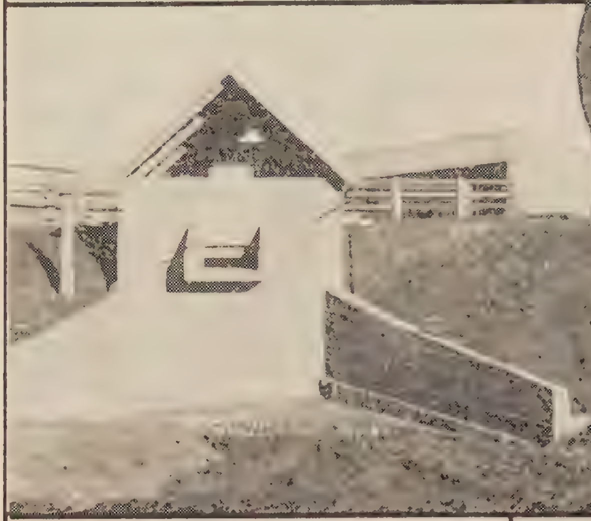
A dairy farm must have an abundant supply of cold water from a reliable source for watering stock. Stock should not be allowed to drink from stagnant pools, as these are a source of the organism responsible for ropey milk. There should be a plentiful supply of clean, cold water, preferably not higher in temperature than 58 degrees F. in summer, for cooling the milk; a well or bore near the milking shed is ideal. Water from the town main or a tank or piped from a well some distance from the shed is too warm for cooling milk. Water taken from a creek is unsuitable, as there is always the possibility of contamination.

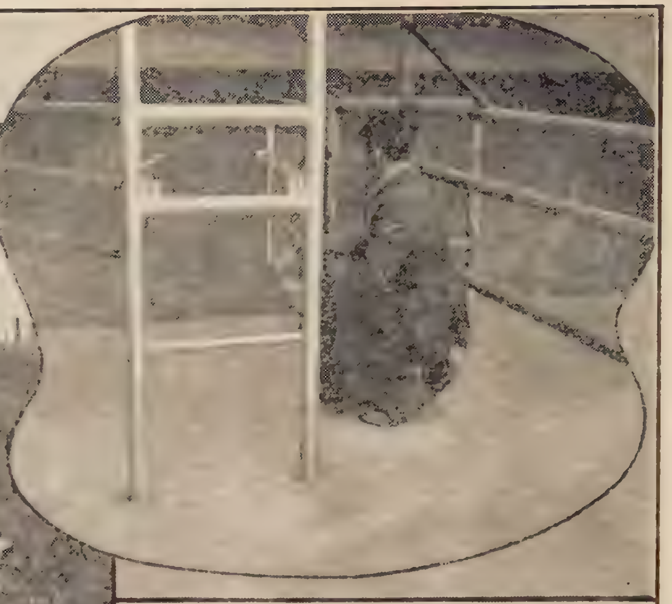
## The Cow

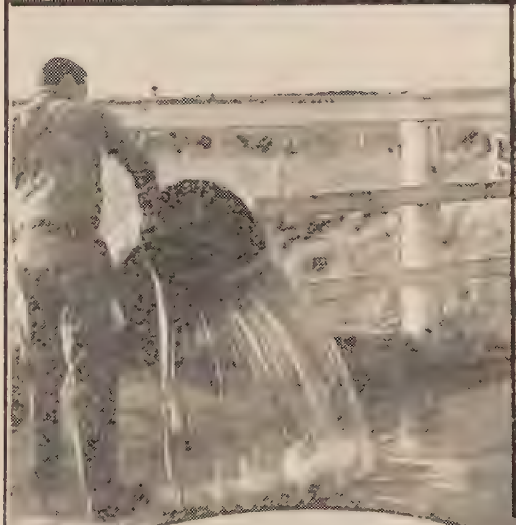
The farmer should select the type of cow suitable for his district, always bearing in mind that minimum tests of 3.25 per cent. for butterfat and 8.50 per cent. for solids other than fat are required.

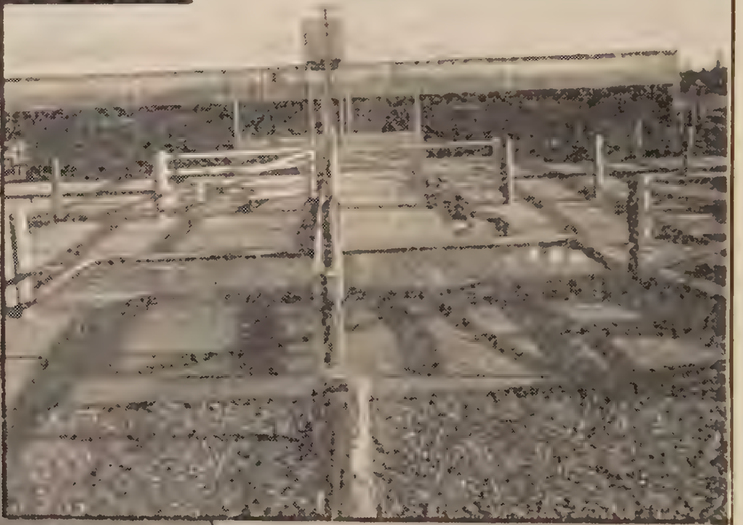
**It is dangerous to build up a herd on this standard, however, as there is no margin of safety and tests fluctuate so much under various conditions that there is the constant worry of producing milk of lower than minimum standard.**

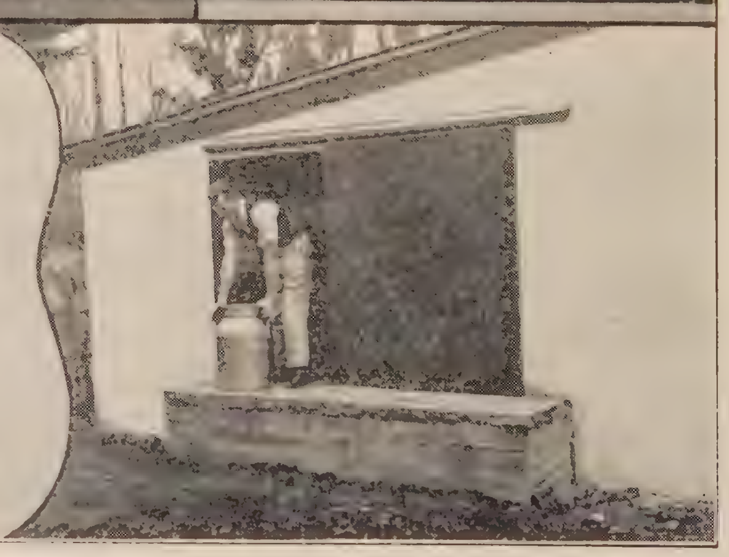
# TOWN MILK DAIRIES: BUILDINGS AND EQUIPMENT











Upper left—A covered sump, showing manure-loading outlet. Upper right—Modern bail construction; the metal is being given a coat of aluminium paint. This type of bail is easily cleaned and is very sanitary. Middle left—A pivoted 44-gallon drum provides for efficient sluicing of a yard. Middle right—A modern layout; the entrance is through a foot bath. The tank on the roof of the shed holds water for water heaters and for washing down, not for cooling the milk. Lower right—A milk loading stage.

Good calves from good cows. Producers who are able to breed their own replacements find it very profitable.

As there is every possibility of milk being paid for on a quality basis, any producer with a low-testing herd should give serious consideration to the matter of introducing higher-testing cows into his herd. Generally, replacements for the herd are obtained in four ways: By rearing heifers from high-producing cows, purchasing heifers privately or at sales, buying stock at clearing sales on farms, or purchasing cows at saleyards.

Though many producers supplying milk all the year find it impracticable to breed their own replacements, those able to do so find the practice very profitable, as they usually get better producers, higher testers, and healthier cows. The purchase of heifers in preference to old cows has everything to commend it. Though heifers may be culled by breeders, there is not the same risk of introducing disease into a herd through cull heifers as there is through cull cows—they will not have developed bad habits and they have the whole of their milking lives ahead of them. Good cows are always difficult to procure, which explains why guaranteed cows offered at clearing sales of reputable dairymen are always in demand.

### Testing

There are too few town milk dairymen who test their cows, probably because so few rear their own heifers, and replacements are not easily obtained. Many farmers using milking machines have no idea what quantity or quality of milk their individual cows are producing. Unfortunately, too many cows are nothing more than liabilities to their owners, producing either low-quality milk or a small quantity of it, and often both.

Any town milk supplier who wishes to check his herd will receive every assistance and encouragement from the analyst at his treating house, who will test the quality of milk from any one cow or from the whole herd. All the farmer need do is weigh the night's and morning's milk from a cow and send a true sample of each to the analyst. A few cows could be tested at a time. There is usually a herd testing association, which can carry out this work in a systematic manner, and the farmer has everything to gain by taking advantage of its service.

## Feeding

Next in importance to breeding is the feeding of the herd; an animal with an impressive pedigree is of no use unless it is fed properly. Good pastures regularly chain harrowed and topdressed, small paddocks, and frequent changes for the cows pay handsome dividends. However, the real test for the town milk producer comes when there is little or no grass and the weather is cold and wet. It is under these circumstances that the dairyman who provides ample supplies of good-quality feed for healthy, high-producing cows, the only kind worth keeping on any farm, reaps his reward.

Feed is not weighed in New Zealand, but, like human beings, some animals need more than others. Knowledge of animal husbandry, the feeding of stock, and the quantity to be given is gathered by experience and the use of common sense and cannot be gleaned from books alone, but a good guide is the well-known maxim: "When dairy cows, milking in the winter, lick the paddock clean, they are still hungry." It is always wiser to waste a little feed rather than underfeed stock.

### Winter Routine

As climate, the breeds of dairy cows, and the opinions of excellent farmers vary so much throughout New Zealand, it would not be practicable to lay down any hard-and-fast rules for the feeding of milking cows in winter. The purpose of this article will be served by suggesting a practical general guide for a district which experiences cold weather and where the farmer has to rely almost exclusively on the winter feed which he grows for his stock.

After the morning milking a good feed of hay should be given. If chou moellier is being used, it should be fed with hay at the second feeding, about 11 a.m., and care should always be taken to see the frost is off the chou moellier before it is given to the herd. Silage can be used in place of chou moellier and fed with hay for the 11 a.m. feed. When chou moellier or silage is fed out at the morning feed, there is no risk of any milk taint. The two feeds mentioned will provide sufficient for the herd until the evening milking. After the evening milking the cows should again go out to a good feed of hay and silage.

**Silage and chou moellier must not be fed together at the same feed, as the combination of them causes fermentation, with disastrous results—blown cows and digestive disorders.**

## Disease in Cows

In the definition of "milk" strong emphasis is placed on the "healthy cow." Good milk can be expected only from healthy cows, and the Dairy (Milk Supply) Regulations provide that it is the duty of every occupier of a registered dairy to notify the Dairy Inspector forthwith if any of the occupier's cows appear to be suffering from any disease or disorder of any nature tending to contaminate or injuriously affect the milk.

The health of the cows is extremely important, and the herd of a new milk supplier receives a close examination to ascertain if disease is present, and the cows are inspected at intervals thereafter.

The analyst at the treating house and the Dairy Inspector co-operate closely. Should the bacteriological examination of a particular supplier's milk reveal signs of pathogenic organisms, an immediate inspection of the whole herd is carried out, and, if necessary, the milk from each cow is tested.

Inspectors of Stock, who are able to detect early clinical cases of disease, inspect all stock at saleyards, and they are authorised to condemn animals suffering from a disease scheduled under the Stock Act, 1908, and to assess their value for compensation.

Considerable advances have been made in recent years in the treatment and control of diseases such as mastitis and *Brucella abortus*, the latter being responsible for undulant fever in humans. Heifers are vaccinated against *Brucella abortus* and the incidence of the disease is being effectively lowered. The following records for cows vaccinated as calves include all calvings up to the end of the 1946 season:—

| | Abortions (per cent.) |
|---|---|
| 67,974 first calvings .. | .. 2.9 |
| 23,420 second calvings .. | .. 2.4 |
| 10,064 third calvings .. | .. 2.2 |

In these herds during the season immediately preceding that in which the first-vaccinated heifers calved, 19 per cent. of the unvaccinated 2-year-olds and 7 per cent. of the unvaccinated older cows aborted. In an examination of blood from vaccinated cows which aborted 42 per cent. gave negative results. It would appear, therefore, that vaccination has reduced contagious abortion to less than 2 per cent.

Most cases of mastitis are now treated with penicillin and so far results are most encouraging. Contagious abortion and mastitis have an important bearing on the quality of the milk supply. Tuberculosis, too, is a dangerous disease in dairy cows and receives the close attention of Veterinarians and Inspectors of Stock of the Livestock Division.

The Division renders service to the town milk producer in many ways and Veterinarians are available at all times for testing, examining, and treating dairy herds.

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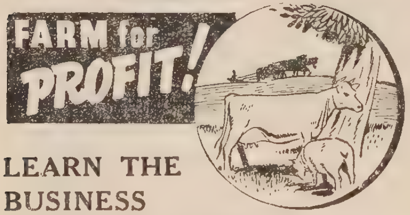
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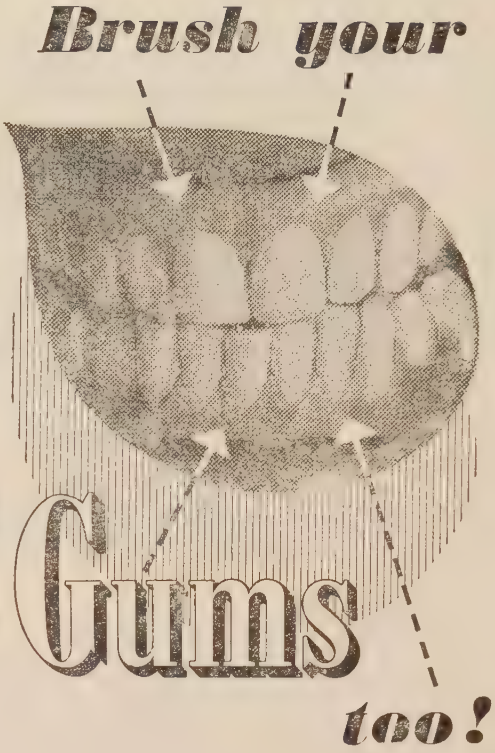

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Contented and healthy cows feeding on hay and roots in winter; note the small amount of feed left in the paddock.

Blood and milk samples for testing for contagious abortion and mastitis respectively are examined at the Department of Agriculture Animal Research Station, Wallaceville, in the constant fight to keep the diseases under control. Disease lowers milk production.

## The Milking Shed

To the casual observer a milking shed is a place for milking cows, but for the town milk producer it is a workshop where a delicate industry is carried on twice daily for every day of the year, where the milk supply for towns and cities is produced, cooled, and stored, and where all risk of contamination must, as far as possible, be guarded against.

An experienced builder remarked recently when constructing a modern milking shed for town supply that he had no idea there were so many details in a cowshed. In the plan of a modern milking shed and dairy for town milk supply there are many details in construction, and every one provided not merely by accident or guesswork, but after many years of research, close study, and development materially assisted by dairy farmers. So impressed have visitors from overseas countries been with these buildings in New Zealand that many plans have been requested from and taken abroad, one being taken by a refugee returning to Vienna. In view of this, the following statement is now interesting reading:—

"In 1902 the Government [of New Zealand] offered prizes for the best plans of a cow shed and silo. There were thirty-eight entries, but that the desired result was not achieved is apparent from the decision of the judges, whose summing up was short and to the point. It read: 'We have to report having gone through the plans, but regret to say that in our opinion none of them are of sufficient merit to warrant their acceptance as a guide to settlers as to what a cow shed or silo should be, therefore none of the competitors are entitled to the bonus.' Consequently, no prize was awarded."*

Today plans are available from any office of the Department of Agriculture or from Inspectors of Stock. Before any dairy building is constructed or any alterations made the Inspector of Stock or Dairy Inspector must be consulted if the producer is supplying or contemplates supplying milk for town consumption. The site of the building has to be approved by the Dairy Inspector, and other conditions and regulations have to be observed.

Occasionally one hears the threadbare argument that up-to-date milking sheds are not necessary; that good-quality milk may be produced in any milking shed. That is perfectly correct —the human element is the dominating factor—but it is much easier to carry out the work efficiently and expeditiously in a comfortable building with every modern convenience.

Other critics, invariably people who have never milked cows for town supply, occasionally voice the opinion that the standard for sheds is too high. Nothing is too good for the farmer who is prepared to milk his cows all through the year and continuously measure up to the high standard demanded of town milk producers. The answer is best left to the producers themselves. Throughout New Zealand the best shed available is demanded by the dairyman, and, almost without exception, those producers who alter their existing old sheds (at considerable expense) soon regret that they did not make the first cost the last and build a completely new structure.

### Important Points

When a milking shed is being built the following points should receive consideration:—

1. Avoid hollows or depressions; if possible, select an elevated position. Where the ground is flat the tendency is to raise the whole foundation at least 2ft.
2. There should be a good approach from a public road.
3. The shed should be as convenient as possible to the paddocks and placed in such a position that cows approaching and leaving it do not pass the dairy end of the building.
4. Provide for suitable fall for drainage—the fall should not be in the direction of the dairy.
5. Availability of electric power if the area is reticulated.
6. Availability of an abundant supply of suitable water for cooling the milk, preferably from a nearby well or bore.

The dairy buildings should be on clean ground, well away from anything which may cause a nuisance. Pigs are required to be kept at least 50 yds. away and poultry at least 30ft. away from the vicinity of the dairy and milking shed.

**Pigs or poultry are not permitted to wander or remain within the distances stated.**

It is not sufficient merely to wash down the shed and yard twice daily; milk stools, door handles, leg ropes, posts, and walls must be kept scrubbed clean. Nothing is allowed in the dairy except the actual plant for the milking operation. The days when the dairy was used as a storeroom have long since passed.

Manure heaps outside the yard fence are not permitted. Manure can be disposed of satisfactorily by collecting it in a tank on a trolley or sledge, which can be emptied regularly and frequently. Manure heaps are excellent breeding grounds for flies, which are a serious contaminating influence.

The environs of the dairy buildings must be maintained in a sanitary condition. Dirt and dust are potent causes of bacterial contamination, and odours are readily absorbed from an impure atmosphere.

The plans of milking sheds today provide for an abundant supply of clean water for washing down. Water troughs are recommended at specified points, and a perforated water pipe running along the back wall of the milking shed has distinct advantages. All walls must be concreted and plastered to a height of not less than 4ft., but the most-favoured shed has complete concrete walls plastered to a very smooth finish, all walls rounded off to the floor to avoid corners for dirt and to facilitate better drainage, and floors have ample fall.

A town milk producer's dairy must be large and well ventilated. Many cans are handled and cleaned, and in addition to having room to work in comfortably a large dairy provides more air space. A cool, sweet dairy is most essential when milk is being produced, cooled, and stored for town requirements.

There should be no woodwork at floor level and the ceiling and walls above the concrete (if only 4ft. high) should be lined with some material impervious to water. Everything must be done to reduce the dust nuisance to a minimum.

Broadly, in a registered dairy no new or used milking machine or part of one may be installed without prior approval by the Inspector of Stock, and every used machine or part of a used machine must be inspected and approved before being installed. All installations of new or used plants are inspected and must comply with the Regulations.

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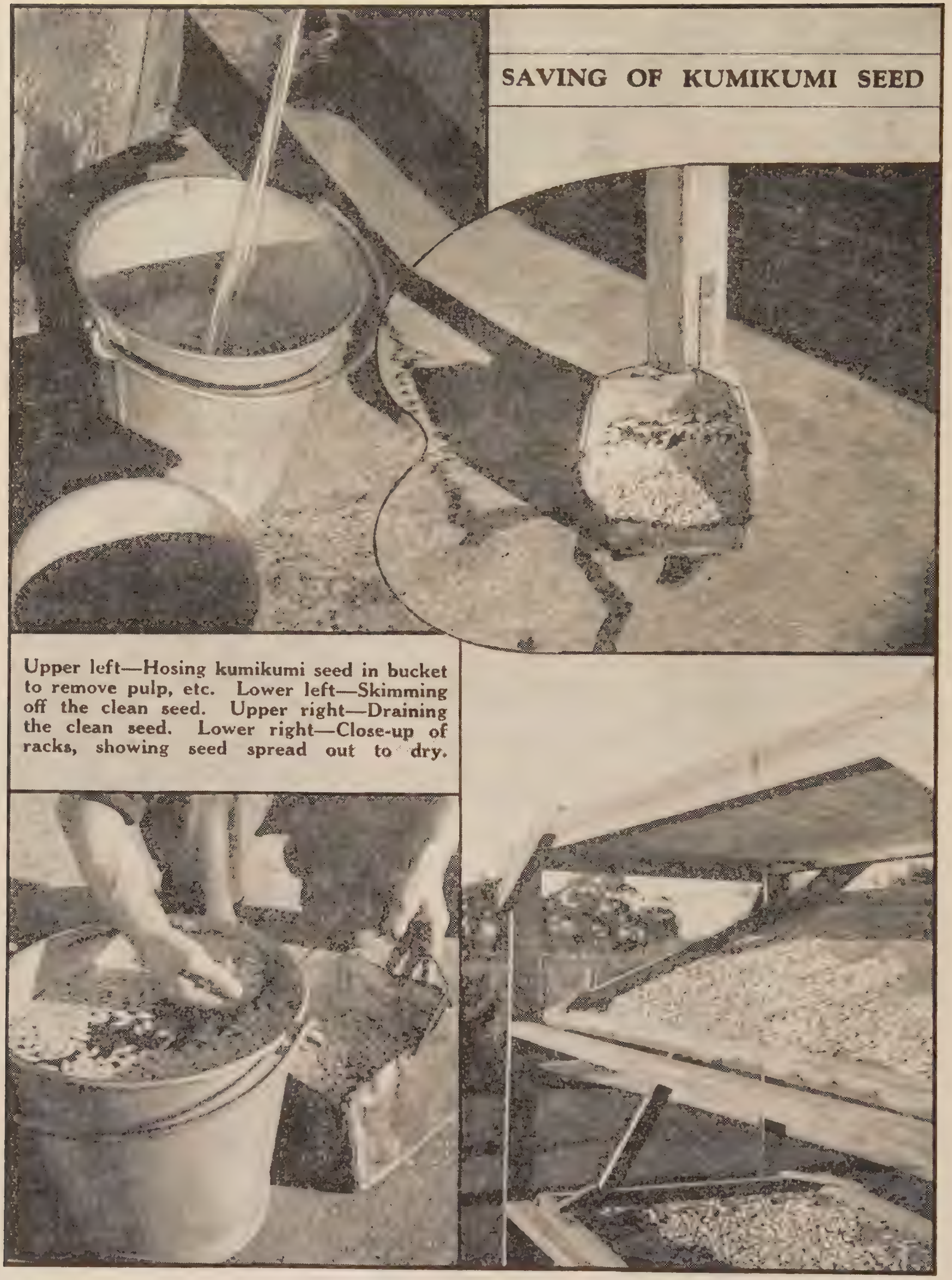
* "A History of the New Zealand Dairy Industry," by H. G. Philpott.

# SAVING OF KUMIKUMI SEED



Upper left—Hosing kumikumi seed in bucket to remove pulp, etc. Lower left—Skimming off the clean seed. Upper right—Draining the clean seed. Lower right—Close-up of racks, showing seed spread out to dry.

# Saving of Pumpkin and Kumikumi Seed

**TO assist farmers seeking information on saving pumpkin and kumikumi seed either for their own use or for sale to a seed firm this article has been written by A. V. Allo, Instructor in Agriculture, Department of Agriculture, Tauranga. In it the methods adopted by a farmer near Tauranga who sells nearly half a ton of kumikumi seed every year are described briefly.**

In collecting the seed save only that from well-fleshed kumikumis. The gourd on the left is inferior and should be discarded, but that on the right is well fleshed and the seed from this type should be saved.

THE saving of seed from any of the gourd species is not difficult, but requires a degree of thoroughness and hand work greater than that needed for most other seed crops. In these days of mechanisation the harvesting of cereals and most crop seeds can be done largely by specially designed machinery, but pumpkin and kumikumi seed has to be harvested by hand and is slow work, requiring a great deal of care and attention to detail if the work is done satisfactorily. Frequently the collection of the seed is a family effort, the farmer's wife and family taking over much of the routine work.

The farmer near Tauranga has been saving kumikumi seed for several years, during which time he has put considerable thought into his method of saving seed and has now developed a system which is efficient and thorough and under which seed is produced which realises top prices on the local market. Each year the farmer grows from 3 to 5 acres of maize for wintering his pigs and has interplanted the maize with kumikumi. The maize has yielded from 80 to 100 bushels per acre, while the crops of kumikumi have also been very heavy. The maize cobs are plucked at the end of May, and the cows are then turned into the paddock to graze off the stalks, etc.

After a few days the pigs are turned in. These include bought-in stores and pigs reared on the farm. As soon as the pigs are in the paddock the farmer takes in a barrow for the seed and with a slasher splits open sufficient kumikumi for the pigs for a day or two. The poor gourds are discarded, only seed from large, well-fleshed ones of good type being kept. The kumikumis are split across the middle, not end to end, and the seed is scooped out by hand, as much as possible of the pulp being thrown away. A few days later the farmer splits a further supply of kumikumis for the pigs, again saving the seed from the best gourds.

It is remarkable the way in which the pigs become accustomed to this method of feeding and they do not damage many of the unbroken kumikumis.

## Cleaning of Seed

After the farmer has extracted the seed from the kumikumis he takes the seed to the cow yard to remove any pulp and rubbish still adhering to it. He fills a bucket one-third full with seed, on to which he plays a strong jet of water. When the bucket is full of water the seed floats to the top and can be skimmed off easily by hand into another bucket. The pulp and any poor seeds will sink to the bottom of the bucket and can be discarded. Normally, one washing of the seed will suffice, but, if there is a great deal of pulp, another hosing may be necessary. After the seed has been washed it is drained out in a bucket with several holes at the bottom and is then taken to the house for drying.

**The drying process is the most important part of the saving of seed and requires considerable patience. Poorly dried seed quickly develops mould and fungi and its appearance is spoilt for commercial purposes.**

This Tauranga farmer has made a series of racks on which to dry the seed, each rack holding four sacking-covered trays. The seed is spread out thinly on the trays and stirred daily until it is thoroughly dry, when the thin outer covering of the seed rubs off on handling.

The time needed to dry out the seed thoroughly varies according to the weather. If the days are sunny and fine, the racks are put outdoors during the daytime and taken inside at night, and it will take about a fortnight for the seed to dry thoroughly. If, however, the weather is wet, drying out will take much longer, and great care has to be taken to keep the seed well stirred up to prevent mould formation. In wet weather an electric fan may be used to blow a current of air over the drying seed.

When the seed is dry it should be stored in open-mesh bags in a dry, airy place and protected from rats until it is sold or used.

Farmers saving seed near Auckland City frequently take the roughly dried seed to a seed firm where it is dried out mechanically. Though this procedure undoubtedly saves a great deal of time and trouble, it is obviously not practicable for the seed grower in the Bay of Plenty, who has to rely on his own resources to make a good job of the drying.

Yields of seed naturally vary according to the crop, but a good crop of kumikumis will give 350 to 400lb. of seed per acre, which at the rate of 3s. per lb yields a good return to the farmer.

This Tauranga farmer claims that pigs do better on kumikumis from which the seed has been removed, but there is no doubt that any feed value in the seeds is negligible compared with their cash value as crop seeds.

# The grace, dignity, and beauty of lilies

LILIUM AURATUM VIRGINALE

LILIUM AMABILE

LILIUM GILLIAN WALLACE

LILIUM FORMOSANUM

# LILIES

By B. W. DOAK, Palmerston North.

**FOR centuries the lily has been regarded as an emblem of grace and dignity as well as of beauty. Certainly a judicious choice of varieties, properly placed, can put "personality" into a garden. The well-known Madonna lily *(Lilium candidum)*, which graces many gardens, has been esteemed for centuries and has been depicted in many works of art. Other lilies have been highly prized from earliest times.**

IN nature the various members of the genus *Lilium* are somewhat spasmodically distributed over the northern hemisphere; none occurs naturally in the southern half of the world. Though species are widely distributed, there is a concentration in south-east Asia (including Japan) and another in the western States of North America. Only the true lilies, that is those plants with the generic name of *Lilium*, will be dealt with in this article. There are many other handsome plants commonly known as lilies, for example, Belladonna lilies, spider lilies, arum lilies, day lilies, etc., that are excluded from the genus and consequently are not really entitled to be known as lilies.

As a group the true lilies, with a few exceptions, have been considered to be rather difficult to grow in the average garden. This reputation is undeserved, as many of them can be grown readily in most New Zealand gardens. It is said in America that any soil which will grow good potatoes will grow good lilies. A well-drained situation is imperative; it is desirable that the soil should be well supplied with humus to improve texture and moisture-holding capacity; a position well sheltered from winds is also very desirable. The other essential to lily culture is that only healthy, virus-free bulbs should be planted and any plants which become infected should be removed promptly and burnt.

## Preparing Ground and Planting

In making a place for lilies deep digging is very desirable. It is a good plan to remove the soil for a depth of 2ft. and replace it with a specially prepared soil made up of a mixture of good loam, leaf mould, and sand, together with a little bone meal. Where drainage is not very good a raised bed is a great help. This can readily be arranged in an existing border for individual clumps by using old bricks or similar material for a surround to keep the soil in place. The bricks can easily be hidden by appropriate planting. The depth of planting is determined largely by the lilies that are to be planted and also by the nature of the soil. There are two main divisions of lilies when classified according to the habit of rooting—whether they produce roots on the stem above the bulb or not.

[*Douglas Elliott photo.*

All lilies produce roots from the base of the bulb, but some known as "stem-rooting" types send up a second set from the stem each year. It is desirable to plant the stem-rooting types rather deeper than the others. It is frequently recommended that stem-rooting lilies should be planted 9in. or more deep, but this is neither necessary nor desirable in average soils. Six inches of soil above the bulb is all that is required, and in many cases 4 or 5in. is quite sufficient. In heavy soils planting should be shallower than in the sandy soils. *L. candidum* requires only an inch of soil above the bulb.

Bulbs should be planted as early in the autumn as soil conditions allow. This is usually from mid-March onward, but every endeavour should be made to have planting finished by the end of April. Early planting helps very greatly to ensure vigorous basal root growth, which is essential to the well-being of all lilies. If planting is delayed until the soil is cold, the bulbs will not form new roots until the following summer, and though they may flower reasonably well, they frequently die immediately after flowering.

**A vigorous root system is a prime requirement and planting while the soil is still warm is the surest and easiest way of obtaining good roots.**

Bulbs should be planted with the least possible delay, and if they cannot be dealt with promptly, they should be kept in damp sphagnum moss and not allowed to dry out. The basal roots should remain on and should be carefully protected from damage.

None of the lilies requires a limy soil, though a few will tolerate a slightly alkaline soil. Lilies such as *L. candidum*, *L. testaceum*, and *L. chalcedonicum* possibly may even prefer a soil well supplied with lime, but they will grow quite satisfactorily in somewhat acid conditions. On the other hand some lilies, notably *L. auratum*, definitely dislike lime. Consequently, as a rule, it is best to avoid the use of lime.

## Lilies for Interior Decoration

Lilies are grown in the garden for garden effect, for use as house flowers, or for both reasons, but some are not suitable for house decoration because of their heavy, somewhat unpleasant scent. The following lilies are unsuitable for cutting purposes: *L. amabile*, *L. hansoni*, and Marhan and Backhouse hybrids. For interior work the trumpet lilies are excellent. Of these the following are easy to grow: *L. longiflorum*, the pure white trumpet or St. Joseph lily; *L. regale*, white with yellow throat and reddish brown on the back of the petals; Princeps hybrids, which are similar to *L. regale*, though the flowers are larger and later flowering; Crow hybrids, which have lovely trumpets with pale green throats and greenish reverse to petals; and centifolium hybrids, which have large trumpets and are tall growing, thus enhancing their value for the back of the flower border.

There are other lilies without the conventional white colour and trumpet shape which have merit in the flower vase. Outstanding in this respect are certain forms of *L. davidi*, the variety *macranthum* and certain hybrids being especially good. Because of their flower placement and stiff stems the varieties mentioned lend themselves to arrangement better than the related *L. willmottiae*. Their flowers are a

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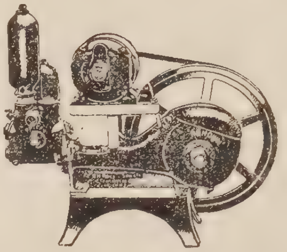

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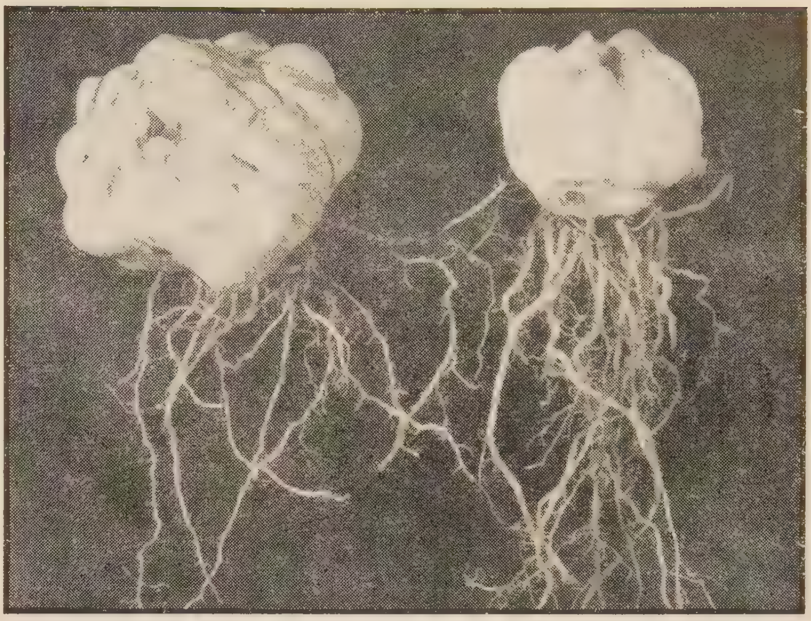
pleasing orange and are reflexed, and all the buds will open in the vase, with the result that a stalk can be kept for almost a month even during hot weather. The general effect, together with the lasting quality, makes these lilies particularly good. Superior strains of *davidi* hybrids show considerable colour variation from yellow through various shades of orange to tomato red. These lilies also have great merit for garden decoration and are very easy to grow.

Another coloured lily with upright flowers that is effective for floral work is *L. dauricum wilsoni*, especially if it is grown in light shade. The colour is a soft orange. The Bellingham hybrids add a different touch with reflexed and spotted flowers. These are highly regarded in the United States of America where they are largely used for cutting purposes. The well-known *L. speciosum*, which flowers at the end of the lily season, has pure white, pink, and red forms. These are especially useful for cutting purposes and lend themselves to easy arrangement. In addition the *speciosums* are easy to grow. All the lilies so far mentioned are equally effective for garden decoration, and there are many others. For example, the various forms of *L. umbellatum*, many hybrids such as Preston hybrids (named and seedlings), *scottiae*, Red Wing, etc., can be recommended for garden purposes.

Every gardener who is interested in lilies wants to grow the magnificent *L. auratum* in one or more of its fine forms. There is no reason why success cannot be obtained if certain precautions are taken. First, do not use any lime, as this lily likes fairly acid conditions. Second, provide a well-drained position in a loose, friable soil. Third (and most important), plant only healthy, virus-free bulbs. Fourth, do not plant too deeply; 5in. deep is ample. Finally, keep plants free of insect attack. If these conditions are fulfilled, this lily should thrive.



*[Photo News Ltd. photo.*

**Bulbs of *Lilium auratum*. The outer scales are tinged with yellow, while the scales at the centre are slightly pink. Note the hollow place where last season's stem grew. The bulbs, raised from seed, are 4 and 5 years old respectively.**

*[Photo News Ltd. photo.*

**Seed pods developing on *L. auratum platyphyllum*.**

## Provision of Shade or Mulch

Exposure to full sunlight can be tolerated by quite a number of lilies, though many prefer light shade during the hotter part of the day. In very hot situations some ground cover is desirable to prevent the soil becoming too hot. A mulch can be effective or annuals can be used to provide shade for the lower part of the lily stem. Planting among low-growing shrubs can be effective in providing that ground cover so necessary in obtaining a cool root run. The most effective plantings from an artistic point of view demand suitable backgrounds and comparison plants. These are matters for the individual gardener, but attention is drawn to the association of *L. candidum* with delphiniums. Many other combinations can be effectively worked out.

The lilies mentioned in this article are only a few of those which can be used. For others the reader is referred to the lists of reputable nurserymen. Beginners are advised to attempt only the lilies which are not difficult to grow, a list of which follows:—

*Amabile*, Backhouse hybrids, *hansoni*, *henryi*, *longiflorum*, Princeps, *regale*, *centifolium* hybrids, *dauricum*, *davidi*, *willmottiae*, *speciosum* varieties, *pardalinum*, Preston-hybrids, *scottiae*, *concolor*, *pumilum*, Maxwill.

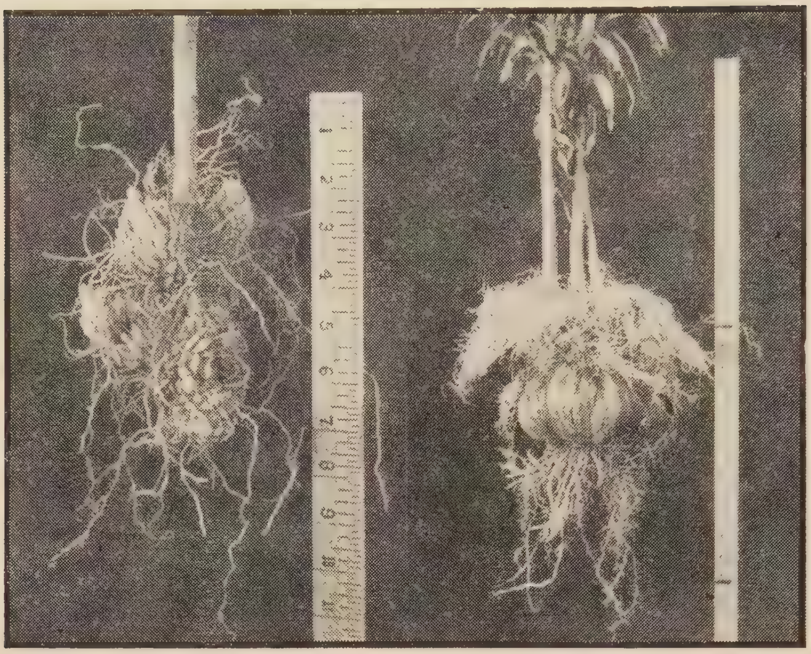
## Propagation

Several methods of propagation are available with most lilies. The bulk of them increase naturally by division of the bulb or from bulblets which are frequently formed on the stem immediately above the bulb. Some varieties increase very freely by this method, resulting in a dense mass of bulbs being formed in 2 or 3 years. With such varieties it is desirable that these should be removed each autumn and planted elsewhere. For the average gardener the two methods of propagation just mentioned are the easiest, but if a large stock is desired, other methods can be used, but the time taken to produce flowering plants will be greater. Most lilies can be propagated readily by using the scales removed from the bulbs. The scales can be set in sand, moss, or in the soil, which should be somewhat dry.

The time taken for bulblet formation varies with the species or variety and with the temperature. The best time to take scales is about flowering time when bulblet formation is usually very fast, but good results can be obtained at almost any time of the year.

A few lilies can be propagated by means of the bulbils formed where the leaves join the stem. When ripe, bulbils fall to the ground and, if conditions are suitable, they will root readily. However, it is best to remove them before they are ready to fall and to plant them in a suitable place. The lilies which produce bulbils are the common tiger lily (*L. tigrinum*), *L. sargentiae*, *L. sulphureum*, *L. bulbiferum*, and some of the hybrids from these lilies.

# PROPAGATION OF LILIES



[*Photo News Ltd. photo.*

Left—A clump of *Lilium pardalinum* bulbs with narrow, pointed, white bulb scales. Note last year's bulbs each showing a central hollow in which the stem grew. There is no hollow in the centre of bulbs formed in the current season. Right—*Lilium henryi*, a typical stem-rooted lily, showing thick contractile roots formed below the bulb, the broad, thin, reddish-brown bulb scales, and a mass of fibrous roots growing from the stems above the bulb.

All the methods of increase so far mentioned suffer from the grave objection that if the parent bulb is infected with any of the virus diseases, the young stock will also be infected. However, the methods are the only ones by which hybrid lilies can be increased, as hybrid lilies will not come true from seed.

### Raising Lilies from Seed

Growing lilies from seed is very interesting, provided one has the patience to wait for the 5 or 6 years required by some lilies to reach flowering size. Fortunately a number of lilies reach flowering stage in 2 or 3 years. Lilies fall into two classes, depending on the rapidity with which their seed germinates:—

**Quick germinating:** These show top growth within a few weeks of sowing and most of this group flower within 3 years. The following are typical of the group: *L. regale, L. formosanum, L. davidi, L. willmottiae, L. concolor, L. longiflorum.*

**Slow germinating:** These usually show no leaf growth for some months after sowing. For complete germination the seed of lilies of this group require several weeks of warm conditions followed by a similar period of cold temperatures. Nature supplies this during the summer and winter. Seed may be sown in the spring, but leaf growth will not take place until the following spring. Actually the seeds germinate during the autumn and form tiny bulbs underground. The cold of winter produces changes which allow the leaves to grow in the spring. Typical members of this group are: *L. auratum, L. monadelphum, L. giganteum, L. superbum, L. martagon,* and *L. parryi.*

### Diseases

Like most other plants, the lily is subject to certain diseases; the most common are leaf spot (*botrytis*), virus diseases, and basal rot (*fusarium*). *Botrytis* usually is most troublesome in spring during damp, warm weather. The first sign of attack is the appearance on the leaves of brown spots, which may extend until all leaves are affected. Prevention is the only cure. Lilies should be sprayed with Bordeaux mixture or copper oxychloride compound at the first sign of attack. This disease seldom kills bulbs, but as it frequently kills all the leaves, the bulbs inevitably suffer and do not grow in size. *L. candidum, L. testaceum, L. speciosum,* and *L. willmottiae* are frequently affected, but *L. regale* and related lilies are seldom affected.

Virus diseases are the most serious. Several forms occur, but for the purposes of this article it will be convenient to consider them as a group. The chief symptoms of infection are mottling or distortion of the leaves and flowers. As there is no cure for the trouble, infected plants should be removed and burnt. Only virus-free bulbs should be planted, but this cannot always be ensured, as in some species the virus may be masked. It is essential that aphides should be kept completely under control, as these are the chief means of spread.

Basal rot is usually most troublesome in hot summers. Control is difficult, as the damage is severe before any symptoms appear on the top growth. Bulbs should not be planted in places where this trouble has occurred unless the soil has been sterilised by some means. The lilies most likely to be affected are *L. chalcedonicum, L. testaceum, L. martagon,* and *L. monadelphum,* but many others may occasionally be affected.

Bulbs raised from seed, because of their better vigour, are frequently more resistant to disease than those propagated by other means. Nor are virus diseases transmitted through the seed, and consequently seedling bulbs are less likely to be affected with these troubles, but this is true only if precautions have been taken to keep the young bulbs isolated from possible sources of infection. Some species are extremely susceptible to virus and die soon after infection, but others are able to grow well in spite of the disease. Unfortunately these constitute a menace to all lilies in the vicinity. Lilies should not be grown near striped ("broken") tulips, as it has been shown conclusively that the tulip virus can infect lilies.

The main requirements for successful lily culture are adequate drainage and healthy, virus-free bulbs.

# SHOW DATES

THE following are dates and venues of A. and P. shows for March.

March 4—Amuri A. and P. at Rotherham.

March 4—Temuka and Geraldine A. and P. at Winchester.

March 4—Maniototo A. and P. at Ranfurly.

*March 4—Mangonui County A. and P. at Kaitaia.

March 4—Albany A. and P. at Albany.

March 4—Matamata A. and P. at Matamata.

March 4—Waiotira Junction A. and P. at Waiotira.

March 8—Morrinsville A. and P. at Morrinsville.

March 10 and 11—Kumeu District A. and H. at Kumeu.

March 10 and 11—Waikato Central Agricultural Association at Cambridge.

March 11—Mt. Benger A. and P. at Roxburgh.

March 11—Cheviot A. and P. at Cheviot.

March 11—Hawkes Bay A. and P. (Autumn Show) at Hastings.

March 14—Lake County A. and P. at Arrowtown.

March 16 and 17—Christchurch Flock Ram Fair at Christchurch.

March 18—Mayfield A. and P. (Jubilee Show) at Mayfield.

March 18—Poverty Bay A. and P. (Autumn Show) at Gisborne.

March 18—Wellsford A. and P. at Wellsford.

March 18—Upper Clutha A. and P. at Wanaka.

March 25—Hawarden A. and P. at Hawarden.

March 25—Methven A. and P. at Methven.

* The Department of Agriculture Exhibit will be staged at this show.

# Care of Trees in the Home Orchard

IN the experience of officers of the Horticulture Division, many of the problems that puzzle the average home orchardist are common to nearly all growers of a few trees. Some problems which occur frequently are answered in this article by H. A. Prew, Orchard Instructor, Department of Agriculture, Auckland, and further information may be obtained from local officers of the Horticulture Division.

THE question of whether young fruit trees should be pruned when received from the nursery and how it should be done is one which arises each winter.

All young fruit trees should be pruned back at planting. When a young tree is received from the nursery the greater portion of its root system has been cut off; therefore the tree is unbalanced, there being too much top for the root area remaining. If the tree is left in that condition after being planted, the reduced rooting system will have great difficulty in providing sufficient food for the large top, and very poor growth in the first year is usually the result. Pruning back the top at planting restores the balance between root and top growth; the young tree will settle down quickly and make much better growth in its first year.

In addition to the cutting back of the top growth, the roots, many of which will be broken and ragged, should be trimmed to remove the damaged ends and much of the light fibrous and crowded roots.

The main points to be considered when planting fruit trees are:—

Set the tree to the same depth as that at which it was planted in the nursery.

Prepare a hole large enough to accommodate the roots spread out.

Remove the topsoil and loosen the subsoil with a fork; add well-rotted stable manure or compost, or 3 or 4 handfuls of blood and bone fertiliser, and mix it into the subsoil.

Place the topsoil around the roots.

Make sure that the soil is well firmed around the roots; this is essential for good establishment of the tree.

## Controlling Pests and Diseases

Pest and disease control is a subject of interest to all growers of a small number of trees and often poses the questions of what to use, when to use it, and what type of equipment is suitable. Bulletins available free from offices of the Department of Agriculture give full information on sprays—Bulletin No. 161, "The Control of Orchard Diseases and Pests by Spraying."

The main aims in spraying are:—

**Thorough coverage of all parts of the tree:** Satisfactory pest and disease control cannot be obtained unless all parts of the tree are covered thoroughly with spray. Any parts that are missed enable the pests to build up again, so special attention must be paid to the tips of branches; quite a lot of trouble starts there.

**Regular applications of sprays at the correct times:** Study the bulletins carefully, note when each pest or disease is likely to be active, and apply the correct spray at that time, bearing in mind that as both leaves and fruit increase in size sprays must be applied to keep the increased areas covered.

Much of the trouble in home orchards is caused by inadequate and faulty spraying equipment. Obtaining complete coverage of tall trees with a knapsack sprayer is most difficult. The only advantage with this type is that only one operator is required. A bucket pump with 12ft. of hose and a lance about 4ft. long with an ordinary disc-type nozzle is most suitable for the home orchard. The advantages of this type are that good pressure can be obtained and all parts of the tree can be reached easily and covered thoroughly. The one disadvantage is that it requires two operators.

## Spraying with D.D.T.

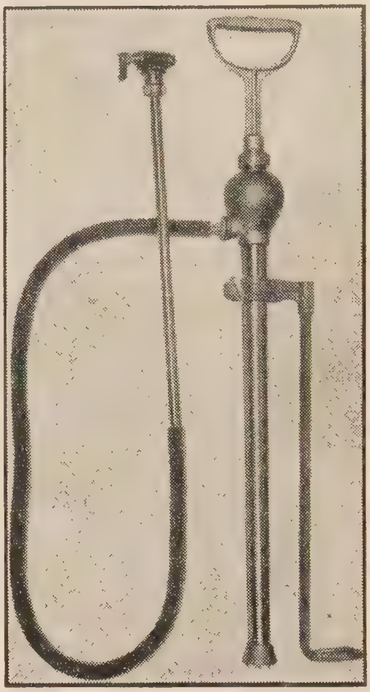
Though arsenate of lead is the spray generally recommended for codling moth, effective control can also be obtained by the use of D.D.T. However, liquid household preparations should not be used for spraying, as the emulsifying agent is injurious to foliage and fruit.

For spraying purposes a wettable powder is used. It is generally obtainable in two strengths, a 25 per cent. and a 50 per cent. mixture. The percentages refer to the actual or active D.D.T. in the powder, so a 50 per cent. powder is double the strength of the 25 per cent. powder.

The recommended strength for spraying for codling moth is 1oz. of full-strength D.D.T. to 25 gallons of water; therefore, if 50 per cent. powder is being used, 2oz. of the powder to 25 gallons of water is the correct amount, but if 25 per cent. powder is used, the quantity should be doubled. This amount of D.D.T. will be found most effective for the control of bronze beetle and most chewing insects.

Unfortunately, D.D.T. kills the predators of both species of red mite (*Paratetranychus pilosus* and *Bryobia pratiosa*), but does not kill the mites, leading to a build-up in the population of these pests, so that specific spraying may be necessary to control them. Adequate control usually can be obtained by spraying with 6½ fl. oz. of summer oil to 4 gallons of water, applying two sprays at not more than a 10-day interval.

Another insect pest that can be controlled satisfactorily with D.D.T. is mealy bug (*Pseudococcus maritimus* and *Pseudococcus gahani*). These insects are very common on vines under glass; some home gardeners have mistaken them for woolly aphis. They lay their eggs in large numbers in sheltered positions, especially under the loose bark of the vine. The first step in securing control of the pest is to scrape all the loose bark carefully off the vines and burn all the scrapings, together with any old leaves, prunings, or litter in or about the glasshouse which would shelter eggs.



A bucket pump is better than a knapsack sprayer in the home orchard because, if it is fitted with 12ft. of hose and a lance about 4ft. long, all parts of the trees can be covered thoroughly. Its one disadvantage is that two operators are required.

Recent experience shows that very efficient control is given by a D.D.T. spray at a strength of 1lb. of full-strength D.D.T. to 10 gallons of water, which would mean the use of 4lb. of 25 per cent. D.D.T. or 2lb. of 50 per cent. D.D.T. to 10 gallons of water. It should be applied immediately before bud burst and one application should be sufficient, but should any bugs survive, a D.D.T. powder of a strength of 5 per cent. blown on the vines at thinning time will clean them up.

**D.D.T. sprays must not be used after the buds have burst, as they cause damage to the foliage. A small dusting gun may be obtained from most commercial distributors of orchard requirements.**

## Citrus Borer

One of the more common pests of citrus trees and one that causes a great deal of trouble in Auckland Province

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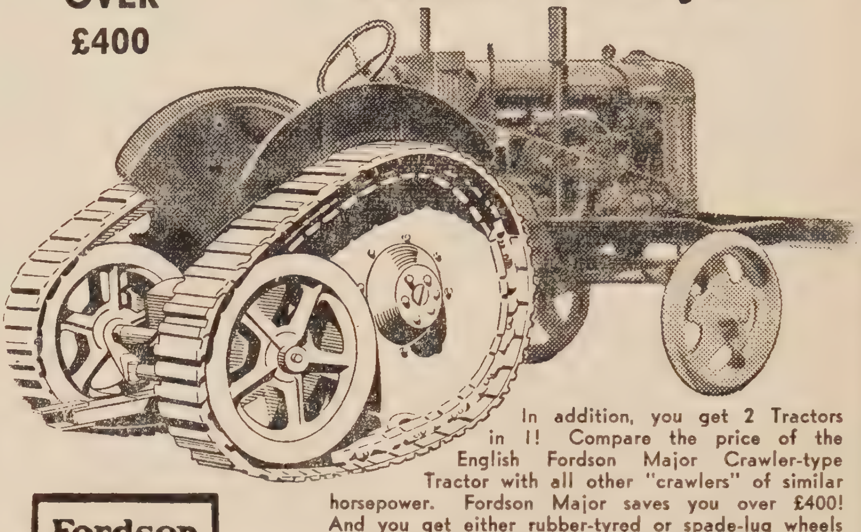

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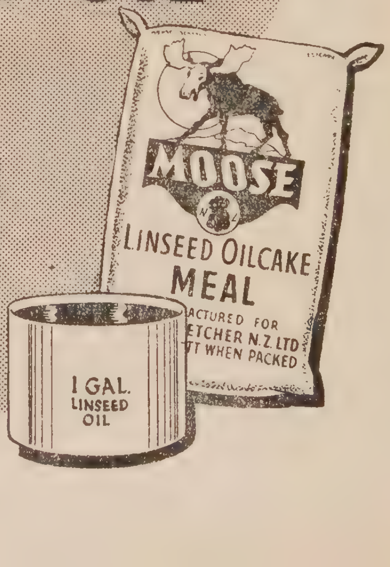


is the citrus borer (*Aemona hirta*). Unfortunately, in backyard orchards the depredations of this pest usually are not noticed until a limb dies and its removal spoils the shape of the tree. A careful examination should be made to see that citrus borer is not present. Usually it is betrayed by a clearly-marked hole where frass, a sawdust-like residue, has been ejected.

The methods to be used for the elimination of citrus borer are:—

> Remove and destroy all dead or badly-infected limbs, including all small branches containing borer.
>
> Probe all holes in larger limbs and the main trunk with a piece of copper wire in an endeavour to kill the grubs.
>
> With a small oilcan inject petrol into all holes and seal them with putty or clay to retain the fumes within the limbs. Kerosene will kill the borer, but it should not be used, as it is likely to injure the tree. Some proprietary disinfectants are effective, but they should not be used without prior advice.
>
> Do not leave stubs or branches. Cuts should be made neatly and as near as possible to the main limbs.
>
> Paint all cuts with bituminous paint to keep the weather out and prevent the entry of more borers.

## Hard Wax Scale

A pest that appears to be becoming more widely established, especially in home orchards, is the hard wax scale (*Ceroplastes sinensis*). They are hard, whitish-grey, barnacle-like appendages found on the twigs and leaves of citrus trees.

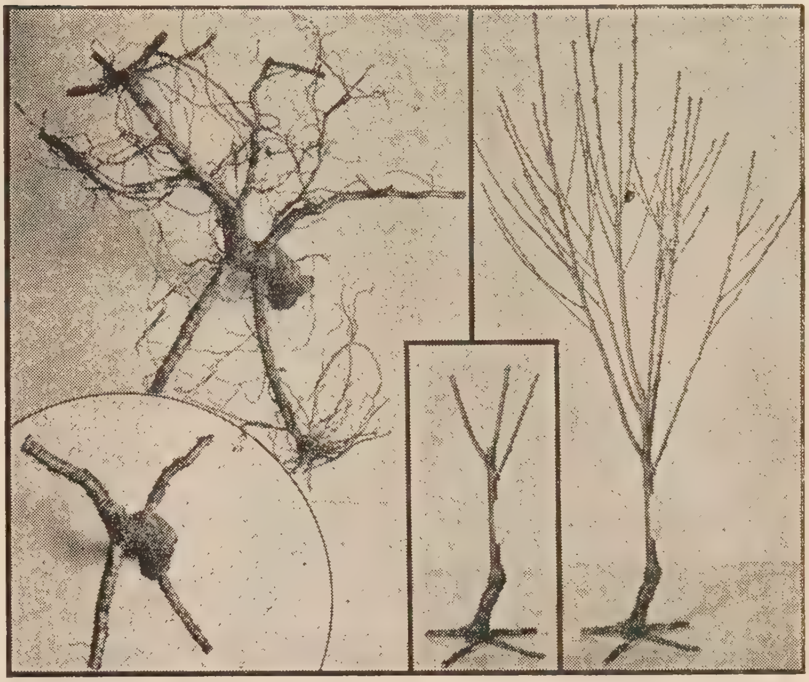
The female scale lays numerous eggs in early summer, and by autumn the young scales are easily recognisable by their characteristic star-shaped appearance, like tiny white stars. As the scales become larger they appear more and more like pieces of candle grease. A fungus disease commonly called sooty mould (*Capnodium citricolum*) is usually associated with these scales. The scales excrete a sweet substance called honey-dew which adheres to the top sides of leaves and twigs and soon becomes covered with this black fungus. When the scales are killed the mould disappears.

Hard wax scales are controlled most readily by the application of summer oil at a strength of ½ pint to 4 gallons of water. It should be applied in late April or early May while the young scales are still in the star stage. The trees must be completely covered with spray.

## Brown Spot of Passion Fruit

Another disease that has been in evidence this year is the infection of passion fruit called brown spot (*Alternaria passiflorae*). Affected fruits develop rounded, slightly-sunken, brown patches and shrivel and fall before they are ripe. Whole shoots may turn brown and wither or only odd fruits may shrivel.

The damage to the fruits normally is accompanied by spots on the leaves and particularly on the stems. These spread rapidly and may completely girdle the stem, when the whole shoot wilts and dies. If only the fruit stalk is infected, only individual fruits will shrivel and fall.



[*Sparrow Industrial Pictures Ltd. photos.*

Left—The roots of a young peach tree as received from a nursery and after being trimmed. Right—The tree with its top unpruned. Middle—The top pruned back to three well-balanced main shoots.

The procedure to follow when this disease occurs is:—

> Remove and burn all dead parts of the vine and all diseased and shrivelled fruits.
>
> Spray at 4-weekly intervals from September until the fruit matures with Bordeaux mixture (4oz. of bluestone and 5¼oz. of hydrated lime to 4 gallons of water). Bordeaux mixture at monthly intervals from March to September will also control the bacterial disease grease spot (*Phytomonas passiflorae*), which is distinguished from brown spot by the oily or water-soaked areas on the fruit.
>
> At pruning time open up the vine to facilitate spraying.
>
> Make sure that the vines are sheltered. The point of entry of the fungus is often found to be where the vines have rubbed on wires or other supports.

## Seedling Trees

The fruiting capabilities and fruit quality of seedling trees usually are unpredictable. The main objections to chance seedlings are that they seldom prove superior to the varieties already in cultivation and generally they take much longer to come into satisfactory fruiting than do budded or grafted trees, the one exception being the peach.

Wondering what the fruit of a seedling will be like may afford some pleasurable anticipation, but because the results are often disappointing the growing of seedlings should be no more than a hobby. A gardener who is short of space and is depending on the trees to carry good fruit would be wise to cultivate only budded or grafted trees.

If peaches and plums are young, they may be budded; apple seedlings may be either budded or grafted. Bulletin No. 81, "The Budding of Pip and Stone Fruit Trees," and No. 285, "Grafting of Fruit Trees," are available free from the nearest office of the Department of Agriculture.

## Leaf Curl of Peaches

A very common disease of peach trees in the home orchard, leaf curl is caused by the fungus disease *Taphrina deformans*. Infection usually is more severe when conditions are cold and wet in spring. Trees exposed to cold winds are likely to be affected more severely than those in warm, sheltered positions.

> **The spores pass the winter in or under the bud scales, so action is essential as soon as the bud scales begin to enlarge.**

The disease may be controlled readily by the application of a Bordeaux spray when the blossom buds begin to move in early spring; the mixture should be 5 : 4 : 50 (6½oz. of bluestone and 5¼oz. of hydrated lime to 4 gallons of water). Many if not most of the failures to secure satisfactory control of leaf curl are the result of poor spray coverage.

As an extra safeguard in the event of bud movement being irregular, or if the first spray has been applied a little too soon, another Bordeaux spray, this time a 3 : 4 : 50 mixture, can be applied 10 to 14 days later.

◆

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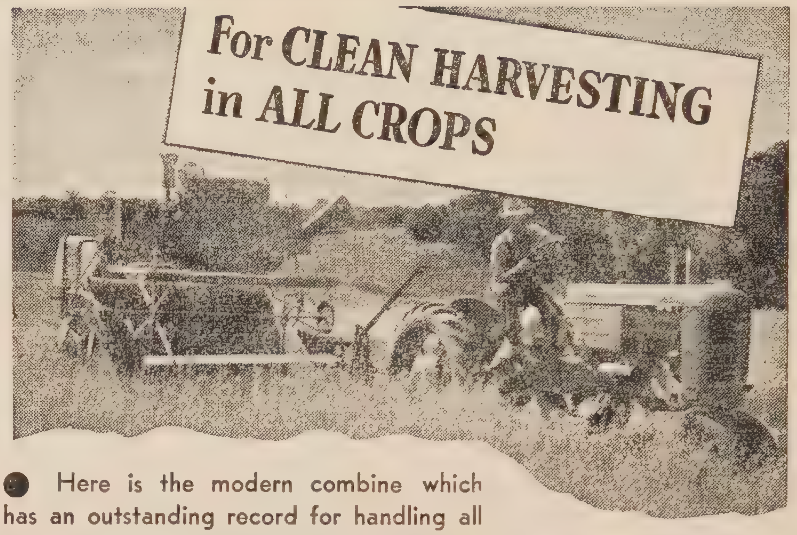

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# CASE

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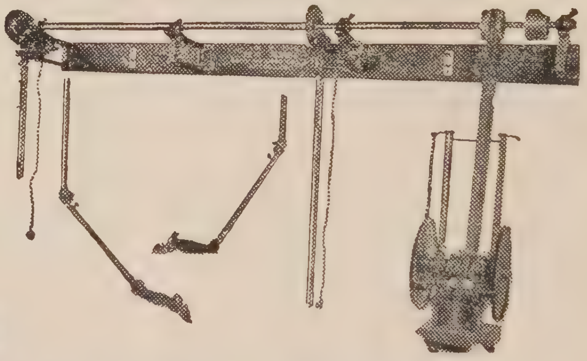

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# Production of Overfat Pigs should be Avoided

COMPLAINTS about the bacon on sale in shops being too fat have been increasing steadily during the last two years. In this article the reasons for this, and methods that can be adopted to avoid producing overfat pigs, are discussed by I. H. Owtram, Extension Officer in Pig Husbandry, Department of Agriculture, Wellington.

ABOUT 2 years ago rationing of bacon ceased. Rationing was done through the retailers, who were limited in the number of sides of bacon they could obtain to sell, and who also had to register with and deal with one wholesaler only. With the removal of rationing there was a rise in the retail price of bacon and a further rise has occurred since.

The abolition of rationing and higher prices had an immediate effect. With bacon more plentiful and dearer, customers soon became more discriminating and expressed their preferences plainly.

**The point on which they were most firm was that they did not want fat bacon.**

The customers' stand has been so emphatic that the retailer is finding it difficult to dispose of overfat sides and either is refusing to accept them or is returning them to the curer. As the retailer can now obtain supplies where and when he likes, he is in a position to do this.

The public has shown unmistakably that their taste, now that they again have free choice, is no different from what it was in 1939. They want plenty of lean meat with a moderate fat cover. The pig producers of the world have shown in the past that they are capable of producing exactly the type of carcass that the market demands, and that they can change the type of pig that they are producing very rapidly. This is due in some measure to the fact that pigs, owing to their short "generation"—the sow farrowed today usually produces a litter 12 months later—can be altered more rapidly than other livestock by selective breeding. This fact does not detract in any way from the skill shown by the breeders, who have demonstrated that they are fully capable of exploiting this characteristic.

## Change in Buyers' Preference

Fifty years ago the demand was for a very heavy, very fat pig—the opposite of what is required today. The change in taste, a perfectly natural one, is due to the enormous changes that have taken place in industry and the standards of living generally in the intervening period. The number of people whose work can be described today as really heavy manual labour is a very small percentage of the population, whereas 50 years ago the reverse was the case.

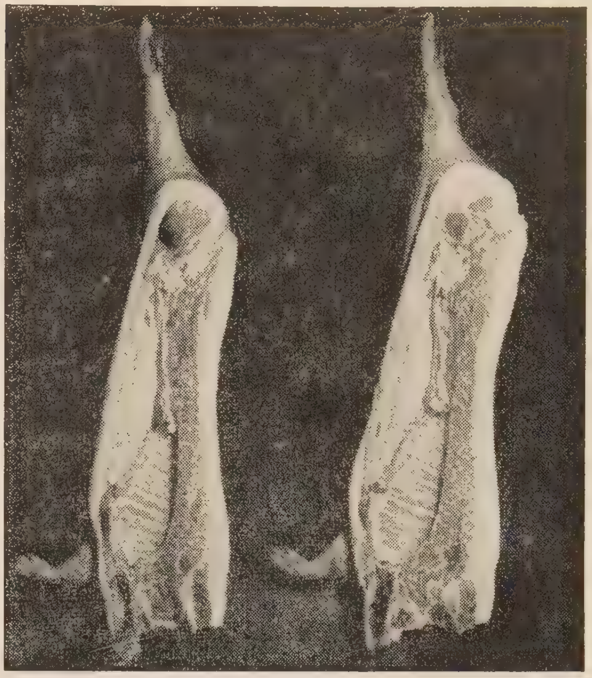
For physical exertion the body requires as fuel carbohydrate in an easily assimilable form, and fat supplies this. Today machinery has taken over the heavy work, and brains more than hands are used. The result is a change in the demands of the body, and high protein nourishment is required; that is lean, not fat, in meat. Again, because the average family today is smaller compared with 50 years ago, the demand for very large joints, which had to come from large and heavy animals, has ceased and a small joint, and hence a lighter carcass, is now required.

Many years ago when lard was the main object of pig production animals that were simply animated bladders of fat were produced, because this was the type of carcass that the market then demanded. Today the market requires a light, meaty carcass with a light fat cover. During the war an increase in weight of meat produced was required at any cost, and in consequence the pig which had been bred over a number of years to produce the right type of baconer carcass at 150lb. was taken up to 175-200lb. and the result was an overfat pig. This weight is still being produced and the resulting fat bacon is not wanted by the consumer.

It is useless to try to force customers to buy something they do not want, as this has only one result—there are no customers.

## Achieving the Desired Result

The first thing that the pig producer must do to achieve the desired result is to use the right type of breeding stock. This is not difficult, as there are strains in all the breeds of pigs used in New Zealand that produce good bacon carcasses. A choice of breed is available, and the good strains have been brought into prominence by the numerous baconer competitions held during the past 10 years. Briefly, the pig required must show good length, a fine shoulder, and a well-developed ham, must be fleshed well down to the hock, and must have a good spring of rib without being rounded. A "slab side" is wanted, not the barrel type.



[*National Publicity Studios photo.*

Left—A side of bacon with reasonable fat cover. Right—A side which is too fat; rashers from this carcass do not find favour with consumers.

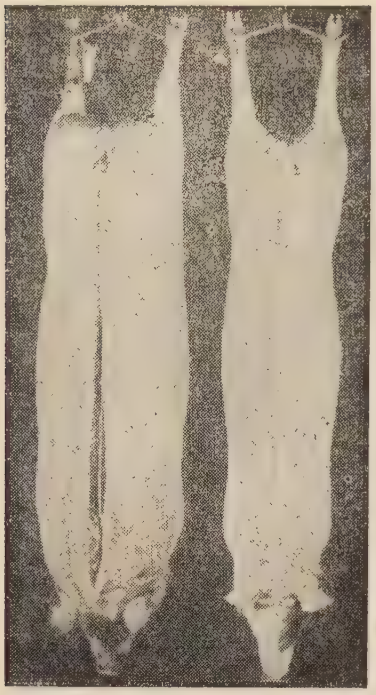
When the producer has the right type of breeding stock the manner in which he handles their progeny is what matters. In fact, this is the most important part of pig production, because, while it is not possible to take a wild pig out of the bush and by skilful feeding and management turn it into a good bacon carcass, it is only too easy, by bad feeding and management, to turn the progeny of good-type animals into really bad carcasses.

## Feeding and Management

Feeding and management are all important, and a brief survey of the main points follows.

A high weaning weight is most important; it is possible (and this should be the aim of all producers) to have all pigs weighing 40lb. or more live weight at weaning. This can be done by creep feeding (particularly with meat meal) and the use of concentrates. A high weaning weight cannot be reached unless the sow's milk supply is supplemented. Moreover, the weight that pigs put on while still being suckled by the sow is the cheapest weight increase in cost to the producer that pigs make.

After weaning there is a rather critical stage until pigs are 4 months and one at which there is a considerable amount of faulty feeding and management. It is essential that pigs should be well fed, that is, they must have a certain amount of concentrates, up to 4 months. Pigs are not very big at this age and cannot handle large quantities of bulky food; in addition, up to the age of 4 months pigs increase the amount of lean meat rather than fat on the carcass and it is most important that this should be taken advantage of to produce a really good carcass. From weaning to 4 months meat meal and, if it is available, barley meal or maize, should be fed at the rate of not less than 1lb. per day to each pig. Care should also be taken to see



Carcass of an overfed pig (left) and correctly fed pig (right).

that at this stage pigs are comfortably housed and not overcrowded. After reaching 4 months pigs tend to put on fat very rapidly, especially if they have access to unlimited supplies of dairy by-products. This occurs all too frequently in the flush of the season today and is one of the causes of overfat pigs. It is a bad policy to keep the trough always full; the quantity should be restricted to 5 to 6 gallons of skimmed milk per day, and when it is the main food used, no supplements are needed. If whey is the main food, the quantity can be increased to 10 gallons per day, and ½lb. of meat meal a day to each pig should be continued up to the time of killing.

The reason for overfeeding being common is that many farmers find that they have not enough pigs for the milk available, and if feeding were such that good finished carcasses at 150lb. weight were produced, still more milk and whey would be available.

**This is the point at which the producer must start to produce carcasses of the right type. If more milk is available than is required to provide pigs of the desired type, more pigs are required, and more pigs for fattening means more sows.**

Sows should be selected now so that they can be mated to farrow in the spring, and these extra sows are necessary if the supply of dairy by-products is to be converted into the right type of baconer carcass for the market instead of the overfat type. This means a bigger profit to the farmer, too, because he gets more pigs from the same amount of dairy by-products and, when payment on grade is reintroduced, as it must be eventually, a higher price for a better article.

# Household Poultry: Causes of Seasonal Mortality

**SERIOUS poultry disease among household flocks in New Zealand is less prevalent than might be expected, probably because of the smallness of the unit. The average backyard flock is 7 birds, which minimises the spread of contagious complaints, especially those of the respiratory system. The diseases that household poultry keepers appear to dread most and tend to diagnose in ailing birds are fowl paralysis and tuberculosis, but more often than not investigation shows their diagnoses to be incorrect. In this month's article W. L. McIver, Poultry Instructor, Department of Agriculture, Hamilton, recommends the household poultry keepers to prevent rather than cure poultry diseases.**

SOME disease must always be expected in domestic poultry flocks, but the aim of the owner should be prevention rather than cure. The study of disease being a specialised subject, preventive steps for the householder cannot be along the lines of understanding the causes of ailments and obviating the factors involved, but must be along the general lines of providing adequate housing, proper sanitation, and good diets.

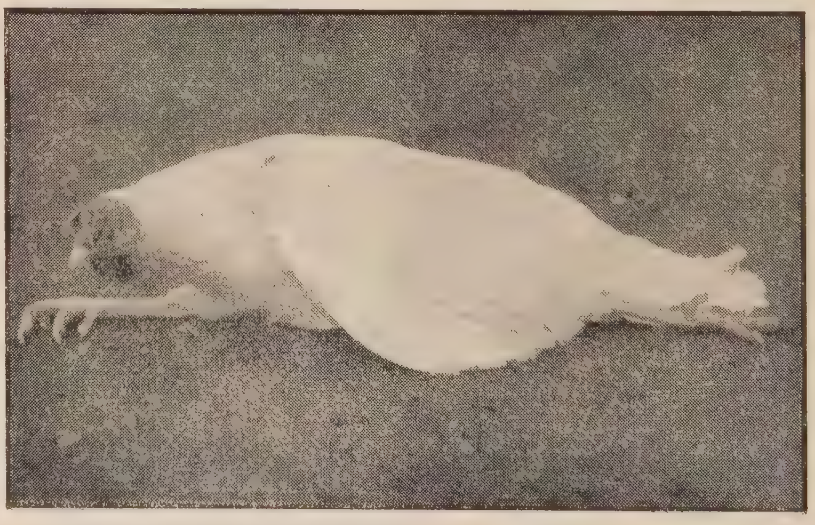
At this time of year poultry fall into two distinct age groups—pullets which are laying or are about to do so, and hens.

Hen mortality in March is likely to arise from one of three factors: Leucosis, including liver enlargement; tuberculosis; and general causes. The owner should make a practice of opening up dead fowls and forming a rough diagnosis. If it is considered that several have died of the same complaint, ailing or dead birds should be sent to the Animal Research Station, Wallaceville. Most cases of deaths from general causes show no wasting of condition on breast or keel, mortality being largely the result of age, organic breakdowns, and moulting strain.

Pullet mortality, if it occurs, will be heavier and probably contagious, chiefly caused by slowly developing diseases caught in chickenhood. Infectious fowl paralysis (leucosis), toxic heart, and pullet disease can all be expected. Leucosis at this age is more likely to be of the leg type. Leucosis, including the common forms of fowl paralysis and big liver disease, is now the worst and most widespread poultry disease in New Zealand, but there are many other causes of non-contagious paralysis. The best preventive against pullet ailments is buying stock from a commercial poultry keeper with a flock known to have a disease-free history.

Sick-looking birds should be removed from the flock and placed in an observation coop if they do not appear seriously ill. If they do not improve fairly rapidly under reasonable treatment, there need be no hesitation about killing them. Except in cases of only a few diseases, lengthy treatment seldom pays.

Infestations of body lice, red mite, and intestinal worms all weaken the bird's constitution and predispose poultry to various ailments. Treatment of these conditions, if they have not been attended to already, the addition of more floor litter ready for the winter, and a general tidying up before the rainy season are tasks which the household poultry keeper should carry out during March.



An advanced case of infectious fowl paralysis.

# PASTURE AND CROP PRODUCTION

## SEASONAL NOTES Contributed by the EXTENSION DIVISION

FARMERS purchasing grass and clover seed for autumn sowing are strongly advised to obtain Government Certified seed. Varieties to which the certification scheme applies are perennial ryegrass, Italian ryegrass, short-rotation (H1) ryegrass, cocksfoot, timothy, *Phalaris tuberosa*, Montgomery red clover, cowgrass (broad red clover), white clover, and subterranean clover.

### CLASSES OF CERTIFIED SEED

Farmers interested only in pasture production should purchase Certified Standard or Certified Permanent Pasture seed. It is cheaper than Certified Mother or Certified Pedigree seed and is just as suitable for establishing permanent pasture required only for grazing. If seed production is a possibility, Mother seed should be sown, while Pedigree seed should be used if the area is being sown specifically for seed production.

### PURITY AND GERMINATION

All Certified grass and clover seeds are sold in sealed containers which bear an official label showing the variety of seed in the bag, the certification class (Pedigree, Mother, Standard, or Permanent Pasture) and the identification number or numbers of the line. Seed certification as such is a guarantee only of the strain of the seed, while the purity and germination certificate gives necessary information on the percentage of living seeds and impurities. Buyers of Certified seed should insist on seeing the official purity and germination certificate covering the line and check the certificate number with the label number.

### CHEAP SEED

Despite the growing demand for seeds of reliable strains and high purity and germination, lines of "cheap seed mixtures" still appear on the market. Some of the lines may be genuine mixtures made up for specific purposes, but most of them consist of cleanings salvaged from the dressing plants. They consist of a wide range of seeds, some useful, some harmful, but in no pre-determined proportions. On the basis of quality and useful species "cheap seed mixtures" are generally dearer than a mixture of first-class seed made up for the specific purpose of grassing a particular class of land.

### STUBBLES

Recent experimental work in Canterbury, though not completely answering the question whether straw stubbles should be burnt or ploughed in, indicates that burning is at least not disadvantageous. Ploughed-in straw, though ultimately supplying organic matter, draws on the nitrogen reserves of the soil while decaying, and trials have shown definite responses from sulphate of ammonia (1cwt.) on succeeding crops where the straw was ploughed in. Comprehensive trials of burning and ploughing in will be carried out at the Winchmore Irrigation Station.

### GREENFEED CEREALS

In the lower-rainfall arable-farming districts catch crop green cereals are used for autumn, winter, and spring feeding, but in the higher-rainfall areas they are generally used for spring feeding only. Experiments conducted by the Extension Division in many parts of New Zealand during the past 3 years have shown that greenfeed oats gave the greatest production in most districts. The oat variety Russet was particularly outstanding in early growth, though it did not show good recovery after grazing. Cape barley and Algerian oats, though not the highest yielding, gave reasonably good early production as well as satisfactory recovery after grazing. Wong barley, a new introduction, gave low initial yields, but showed considerable ability to recover satisfactorily even after repeated grazings. Seed of this variety will not be available in commercial quantity for a year or so. The commercial ryecorn at present available was relatively low yielding, but a new strain from England which is being tried at present is giving yields comparable with the best barley and oat varieties.

After harvesting, sacks containing seed from Certified areas are sealed and branded by Department of Agriculture officers pending machine dressing of the seed. When the seed has been dressed certification tags are attached to the sacks, which are sealed again.

### CROP ROTATIONS AND WHEAT YIELDS

The results of a survey conducted by the Extension Division of all wheat crops grown in certain districts near Christchurch and Ashburton during the past 3 years have shown that the most important single factor affecting yields is the crop that was in the field immediately before the wheat crop. Average differences of up to 20 bushels per acre were found in the Christchurch area between wheat crops after a fallow or good grass and those following another cereal. In the Ashburton district wheat after run-out grass did poorly and yields on such fields were on the average less than where wheat followed another crop, even another cereal. Only in some seasons were autumn-sown crops markedly better than spring sown, though they were never worse. Soil differences within the districts affected the yields only when the growing season was either very wet or very dry.

# Care Needed in Handling New Fumigant

**A NEW fumigant called "Larvacide," for use both in soil fumigation and rabbit destruction, is now being marketed in New Zealand. This product is poisonous to humans, and its dangers and the care necessary in its use are dealt with in this article by I. G. McIntosh, Toxicologist, Department of Agriculture Animal Research Station, Wallaceville.**

SUBSTANCES which are poisonous to animals and birds are also poisonous to man, although with some materials the effects on different species vary considerably.

"Larvacide" follows this general rule of being poisonous to man and animal. Its poisonous effects on man have been known for many years and resulted recently in the accidental death of a rabbiter who permitted the liquid to contaminate his clothes, allowing him to breathe the vapour for a protracted period.

"Larvacide" consists wholly of chloropicrin, a liquid which boils at a temperature a little above that of boiling water, but which gives off at all temperatures a heavy and extremely irritant vapour.

The lung-injuring properties of chloropicrin vapour led to its use as a war gas in 1916, and from then until the end of the First World War it was used by the various armies, mixed with the other main lung-injuring gases, chlorine and phosgene.

## Eye Irritation

When a little of the liquid is poured out, especially inside a room, severe irritation to the eyes is soon felt. In this respect chloropicrin acts like an ordinary tear gas, but usually tear gases are fairly harmless in that they cause no permanent injury. The irritation to the eyes is very obvious, but unfortunately chloropicrin vapour can damage all membranous surfaces of the body, including the delicate ones lining the lungs and the stomach, without producing the same severe irritation. It can be carried to the stomach with saliva and cause vomiting, a feature which led to the name of "vomiting gas" for chloropicrin during the First World War.

The damage to the lungs is the most serious effect of the vapour, and it is this property which makes it poisonous and which ultimately causes death if enough of the vapour is inhaled. It is difficult to imagine anyone willingly breathing air containing a high concentration of the vapour owing to the simultaneous severe eye effects, but if the liquid is spilt on the clothes or used carelessly, small amounts of the vapour can be inhaled over an extended period without unbearable discomfort to the eyes.

## Airing Contaminated Clothing

A little "Larvacide" vapour inhaled for a protracted period is as dangerous as a large quantity inhaled for a short time; therefore clothing on which the liquid has been spilt should be taken off, kept out of doors, and not worn again until all smell of "Larvacide" has disappeared. This would ensure that there would be no prolonged inhalation of the vapour, which would be given off from contaminated clothing for some hours.

It is also essential that operators using "Larvacide" continuously for protracted periods such as in extensive rabbit warren fumigation should work so that they inhale as little of the gas as possible, and this can be done by paying attention to the warning given by the irritation to the eyes. By using the wind so that the fumes are always blown away from the operator's face "Larvacide" can be used safely for long periods.

It has been observed that people poisoned but not killed by chloropicrin often show a number of serious aftereffects and that they are very sensitive to the poison in the future. This point makes it advisable for people who have once been poisoned by chloropicrin to be extremely careful when using it again.

Anyone who believes he has been affected by the gas should consult his medical adviser.

If the liquid comes in contact with the skin, it can cause burns, and therefore it should be wiped, or, if possible, washed off immediately. It dissolves readily in kerosene, white spirit, and carbon tetrachloride, and these substances can be used for removing the liquid from clothes. Clothing can also be made safe to wear by hanging it out in the sun and air, thus allowing the liquid to evaporate.

In case it should be thought that "Larvacide" is too dangerous to make its use practicable or advisable, it is worth pointing out that it is considerably less poisonous than the gas given off when "Cyanogas" comes into contact with water or moist air. It should be handled, however, with the same care as "Cyanogas" and all other poisonous materials.

# METEOROLOGICAL RECORDS FOR DECEMBER

| Station | Height of station above M.S.L. (ft.) | Air temperatures in degrees (Fahrenheit) | | | | Rainfall in Inches | | | | | Bright sunshine hours |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Approx. mean | Difference from normal | Absolute maximum and minimum | | Total fall | No. of days of rain | Difference from normal | Maximum fall | | |
| | | | | Maximum | Minimum | | | | Amount | Date | |
| Kerikeri | 201 | 60.8 | — 1.2 | 82.8 | 38.0 | 1.85 | 8 | | 0.55 | 9 | 219.4 |
| Auckland | 160 | 63.2 | — 0.6 | 77.9 | 51.3 | 3.90 | 10 | + 0.77 | 1.86 | 6 | 221.4 |
| Tauranga | 10 | 61.3 | — 0.7 | 80.0 | 40.0 | 1.69 | 10 | — 1.96 | 0.71 | 23 | 269.7 |
| Ruakura | 131 | 58.0 | — 3.4 | 80.3 | 34.5 | 2.79 | 13 | — 0.39 | 0.80 | 7 | 240.8 |
| Rotorua | 980 | 58.3 | — 1.7 | 79.0 | 37.0 | 2.78 | 15 | — 1.01 | 0.65 | 23 | 239.0 |
| Gisborne | 12 | 62.6 | — 0.6 | 84.6 | 42.9 | 1.01 | 6 | — 0.92 | 0.46 | 4 | 284.2 |
| New Plymouth | 160 | 58.9 | — 1.2 | 71.5 | 44.2 | 5.26 | 13 | + 0.83 | 2.12 | 23 | 237.2 |
| Napier | 5 | 64.6 | + 1.5 | 83.8 | 44.1 | 0.32 | 6 | — 1.73 | 0.13 | 7 | 278.5 |
| Taihape | 2157 | 55.8 | — 0.5 | 74.6 | 41.7 | 2.36 | 16 | — 0.91 | 0.54 | 5 | |
| Wanganui | 72 | 60.5 | — 0.6 | 77.4 | 45.8 | 3.56 | 18 | + 0.80 | 0.98 | 23 | 238.8 |
| Palmerston North | 110 | 59.9 | — 0.5 | 78.0 | 42.4 | 3.17 | 15 | + 0.01 | 0.89 | 23 | 222.4 |
| Waingawa | 350 | 59.6 | — 0.4 | 80.5 | 34.0 | 1.40 | 12 | — 1.24 | 0.24 | 23 | 215.9 |
| Wellington | 415 | 58.6 | — 0.4 | 72.4 | 44.1 | 3.92 | 13 | + 0.63 | 0.86 | 25 | 252.5 |
| Nelson | 24 | 58.8 | — 2.0 | 75.0 | 39.9 | 4.31 | 13 | + 1.30 | 0.76 | 7 | 275.5 |
| Blenheim | 12 | 60.4 | — 1.8 | 80.4 | 40.7 | 2.25 | 13 | + 0.55 | 0.68 | 25 | 266.3 |
| Hokitika | 12 | 54.4 | — 1.6 | 67.9 | 38.3 | 12.63 | 24 | + 2.39 | 1.65 | 26 | 177.9 |
| Hanmer Springs | 1225 | 56.5 | — 1.3 | 83.2 | 34.0 | 2.37 | 9 | — 1.51 | 0.84 | 7 | 227.6 |
| Christchurch | 22 | 59.4 | — 0.4 | 80.2 | 40.0 | 3.72 | 11 | + 1.23 | 0.99 | 8 | 215.4 |
| Ashburton | 323 | 58.2 | — 0.4 | 78.8 | 39.3 | 5.69 | 12 | + 2.72 | 1.36 | 3 | 193.0 |
| Timaru | 56 | 58.7 | + 0.1 | 85.8 | 39.4 | 6.57 | 10 | + 3.95 | 2.85 | 7 | 197.5 |
| Alexandra | 520 | 58.1 | — 2.3 | 82.4 | 34.4 | 1.22 | 10 | — 0.16 | 0.56 | 24 | 201.6 |
| Taieri | 80 | 55.2 | — 0.8 | 77.4 | 33.9 | 2.38 | 19 | — 0.36 | 0.51 | 1 | |
| Invercargill | 32 | 54.8 | — 0.3 | 80.5 | 36.0 | 3.58 | 20 | — 0.07 | 0.68 | 27 | 163.5 |

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# RADIO BROADCASTS

THE following radio talks will be given to farmers from Station 1YA Auckland at 7.15 p.m.:—

March 15—"Control of Crickets," by G. L. Banfield, Instructor in Agriculture, Department of Agriculture, Thames.

March 22—"Pasture Establishment," by J. E. Bell, Fields Superintendent, Department of Agriculture, Auckland.

March 29—"Fertiliser Supplies and Topdressing," by P. W. Smallfield, Director, Extension Division, Department of Agriculture, Wellington.

Other talks are given from 1YA Auckland on Tuesdays at 12.35 p.m., 2YZ Napier on Tuesdays at 7.10 p.m., 2YA Wellington on Thursdays at 12.35 p.m., and 3YA Christchurch on Mondays at 12.20 p.m.

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# Preparing for the Autumn Sowing of a Lawn

WITH the approach of autumn attention should be given to the preparation of ground where lawns are to be established. In this month's notes for the flower gardener M. J. Barnett, Director of Reserves to the Christchurch City Council, discusses the advantages an autumn sowing of lawn grass has over a spring sowing and the steps that should be taken to ensure the sound establishment of a lawn.

[National Publicity Studios photo.

To establish a good permanent lawn close attention must be given to the preparation of the ground before the seed is sown.

EXPERIENCE has proved that lawn grass seed sown in autumn will germinate more quickly, establish itself better, and be more free from weeds than that sown in spring. During March and early April the soil retains much of the heat absorbed during summer, as a general rule the autumnal rains supply the requisite amount of moisture necessary to assist germination without over-saturating the soil, and, further, most of the seeds of the troublesome annual weeds such as fat-hen, shepherd's purse, chickweed, and sow-thistle remain dormant in the ground until the winter is over. Grass seed sown in early autumn rapidly forms a sward thick enough to cover the ground surface completely and exclude most weeds. The few that do come up and persist along with the grass can be easily eradicated. On the other hand, springtime conditions are usually the reverse; the soil is cold, often wet, sticky, and difficult to work, and weeds of all sorts seem to awaken from their winter's sleep overnight. The young, tender grass has to fight for its very existence against the stronger-growing and more robust weeds. Much of it becomes choked out or suppressed by their presence, and the lawn, instead of having that desired close, even sward, is sparse and patchy, the result being that much time and labour have to be expended in checking the weed growth and nursing the lawn into a flourishing state.

To make the most of autumn sowing the ground should be prepared well in advance; in fact if a good permanent lawn is required, too much attention cannot be given to every detail of this work. If the area to be devoted to lawn has not been under cultivation, it should be cleared of all surface growth such as coarse grass. If the site is covered with long rank grass and weeds, this growth should be scythed off as close to the surface as possible and removed for rotting down in the compost heap. Then the remaining growth, which is also removed to the compost heap, is skimmed off with a sharp, broad-bladed grubber. Every endeavour, however, should be made to retain as much of the soil as possible. After the ground has been cleared it should be dug over evenly with a spade, a uniform depth being maintained throughout and the soil broken up to an even texture as the work proceeds. Care should be taken to keep the surface soil as near to the top as possible, for experience has proved that when the subsoil even at a depth of 6in. has been brought to the surface the finer grasses have not done well in it and have been slow in establishing a good turf.

## Removal of Perennial Weeds

When the whole of the area has been dug over and allowed to settle for a week or two it should be worked again and broken down to a finer tilth with a fork. Both during the digging and forking processes opportunity should be taken to remove all perennial weeds such as docks, dandelion, and catsear. At the same time the surface should be made as even and as level as is possible by eye.

The next step is to obtain the final level and this work is begun by heeling the surface regularly and thoroughly all over to consolidate the soil to an even consistency. Heeling consists of treading the surface with the feet with the pressure on the heels. To make a thorough job of it the surface should be heeled, raked, heeled in the opposite direction, and then again raked evenly. The heeling will reveal any slight depressions and the raking will rectify them.

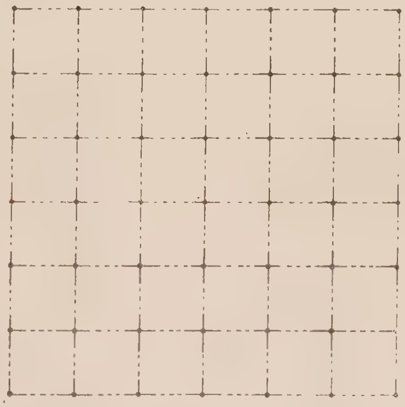


Fig. 1—Method of spacing pegs at 10ft. centres to level an area 60ft. square. Shorter distances between pegs may be used where more accurate levels are required.

When the surface has been reduced to as near a mean level as possible with the eye the final levelling can be undertaken; to perform this work a number of stout pegs, a good straight-edge, and a spirit level are required. Fig. 1 shows how the pegs are laid out for levelling. At one corner a peg is driven in until the top of it is level with the desired height of the lawn. From that corner and in a direct line with the next a second peg is driven in at a distance of 10ft., then the straight-edge, which should be about 12ft. long, is placed over the two pegs and tried with the spirit level; this process is repeated from peg to peg until the whole surface has been covered with pegs at 10ft. centres. Any soil above the level of the pegs is removed and placed in the lower-lying spots.

In certain circumstances it may be necessary to give a fall or slope to the lawn in a certain direction (see Fig. 2). For example, if a lawn 60ft. across is required to have a fall of 2ft. from A to B after the level of the lawn at A has been fixed, each succeeding peg at 10ft. centres is driven in 4in. lower than the preceding one.

Another method of obtaining the general level of a lawn is to fix the level of the four corner pegs with the aid of the dumpy level or theodolite; from peg to peg a stout cord or No. 12 gauge wire is then stretched taut. The intervening pegs are driven in to the level of the stretched cord or wire and

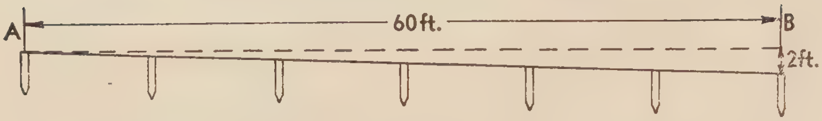


Fig. 2—Method of pegging an area 60ft. across to give a fall or slope of 2ft. in one direction. Pegs are driven in at 10ft. centres, each peg being 4in. lower than the preceding one. A—Upper edge of lawn. B—Lower edge.

trued or checked with the straight-edge and level.

Boning rods are sometimes used to obtain the finished level and in the hands of an expert are both useful and accurate. When the surface has been levelled it should receive a light raking to remove footmarks and to prepare it for the seed. At this stage and before giving the final raking it is a good plan to apply at the rate of 1oz. per square yard a dressing of fertiliser consisting of 3 parts by weight of sulphate of ammonia and 1 part of superphosphate mixed together. Such a fertiliser will act as a stimulant to the young grass when it germinates and will sustain it until it is firmly established.

## Grass Seed Mixtures

When a good, fine-textured lawn is required the grass seed used should consist of a mixture of browntop and chewings fescue. Some authorities recommend 40 per cent. browntop and 60 per cent. chewings fescue; others 30 per cent. and 70 per cent., it being argued that as the browntop seed is smaller than that of the chewings fescue, 1lb. of it will contain three or four times as much seed as 1lb. of chewings fescue. First-class lawns, however, have been obtained by sowing both grasses in equal proportion. Chewings fescue is generally not as permanent as browntop.

For general purposes where a good, hard-wearing lawn is required about 10 per cent. of perennial ryegrass or crested dogstail is added to the mixture. Such grasses not only provide a quick cover, but are hard wearing. The one disadvantage they have is that, being stronger in growth, they require more frequent mowing than the finer grasses. They are also tougher in texture, and unless the mower is sharp and well set, it will not cut them cleanly and evenly.

For poor, light soils which suffer during dry weather yarrow at the rate of 3lb. to every 50lb. of grass is used. White clover is sometimes used for the same purpose. Lawns containing such plants, though quite all right for general purposes, are of little use for the playing of such games as tennis, bowls, or croquet.

It is essential that the grass should be sown evenly throughout the whole area. The amount of grass seed required may be easily estimated by allowing 1oz. of seed for every square yard of the area to be sown. (For bowling greens the usual amount is 2oz. per square yard.) When the required quantity of seed has been determined it is divided into two equal portions; one half is sown in one direction and the other half at right angles to the first. A more accurate method is as follows:—

A strip is formed by stretching a line across the surface to be sown 3 or 4ft. from one edge. Another strip is formed in the same way by stretching a second line parallel to the first and at the same distance from the first as the first line is from the edge. The first strip is sown, then the second, and the first line is used to form a third strip the same size as the other two by being shifted to the other side of the second line. After the third strip is sown the second line is moved the required distance past the first, and strips are formed with the two lines in this way until the whole surface has been covered (see Fig. 4). The number of sowings made will be the same as the number of strips formed; therefore before sowing is begun the number of strips that will be made should be calculated so that the total quantity of seed can be divided into separate lots, one for each strip.

When the sowing has been completed the surface should be raked to bury the seed within the soil; the seed should be raked well into the surface. To prevent birds from eating much of the seed it is sometimes treated with red lead. To do this the seed is spread on the floor and moistened with water from a watering can and turned once or twice until each seed is damp. The red lead is sifted over the heap, which is turned and turned again until each seed is covered with the red lead. Seed so treated should, of course, be sown immediately, for if it is left for a day or two, germination will start. The final operation is to roll the whole surface lightly. This, however, should not be done if the surface is wet or sticky.

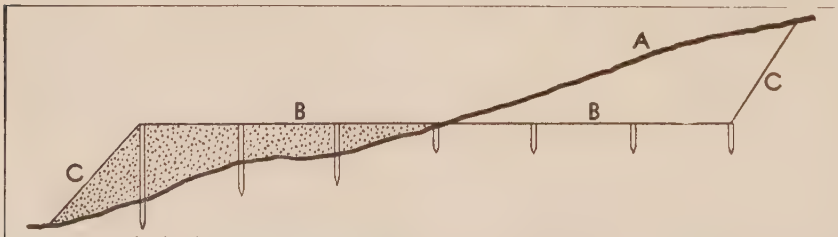


Fig. 3—Method of terracing an uneven piece of ground with a decided slope to one end. The topsoil is stripped off, the area levelled, and the topsoil replaced. A—Original slope. B—New level ready for resoiling. C—Slope.

## Plants to Propagate

During March many of the half-hardy perennial plants useful for summer or autumn bedding purposes and which will not survive the cold of winter may be propagated successfully with a few cold frames or a cool greenhouse where such plants may be overwintered.

### Geraniums

Probably no plant provides such a wealth of bloom from the time it is planted out in the open until it is cut down by frost than the geranium or zonal pelargonium. There are several good varieties to choose from—Maxime Kovalesky, a vivid orange flame; Soldier's Tunic, a good scarlet; Paul Crampel, Saxonia, and Rev. Atkinson, all good reds; and Regalis, which is a double pink variety. There are also the ivy-leaved geraniums such as Chas. Turner, Madame Crouse, Beauty of Perth, and Princess Marie Louise, which have flowers in varying shades of pink and mauve. In addition to those valued for their conspicuous flowers, there are several varieties with variegated and coloured foliage which are most useful as edging plants. Among the foremost of these are Madame Salroy, a dwarf compact variety with small leaves heavily zoned or marked with silver; Harry Hieover, also a compact variety with golden foliage marked with bronze; Crystal Palace, with golden or yellow foliage; Flower of Spring, with green leaves heavily margined with white; and Mrs. Pollock, which is the best of the tricolours.

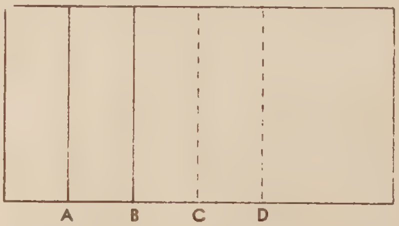


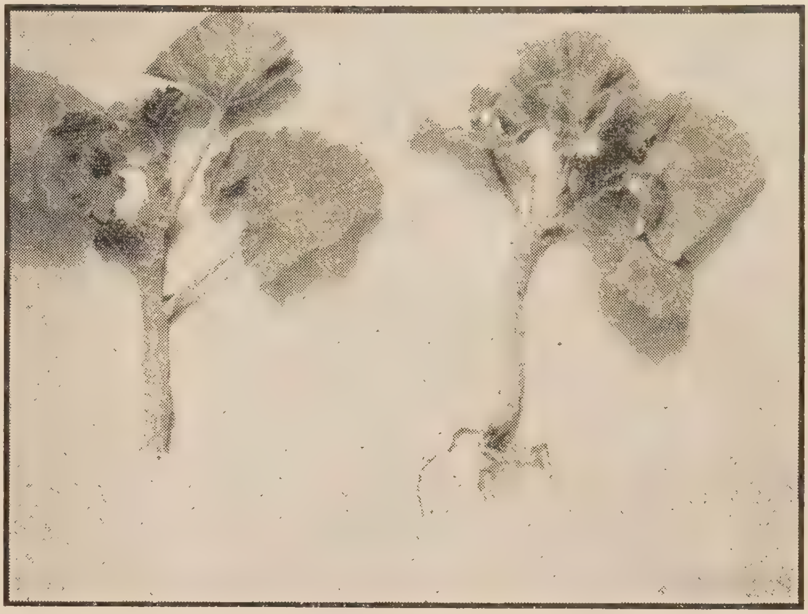
Fig. 4—Sowing a lawn in strips formed by two lines. A—First line placed to form the first strip. B—Second line. C—First line moved to the other side of the second line to form the third strip. D—Second line moved to new position to make the fourth strip.

The geraniums as a whole are most useful and adaptable plants. They will withstand parched conditions and bright sunshine better than most bedding plants, they will succeed in almost any soil, and they will thrive even in comparatively poor soil. The ivy-leaved kinds are excellent for seaside planting and will withstand the effects of salt-laden winds. They are also ideal for covering rock terraces and stone walls and will remain permanent in such situations where frosts of not more than 9 degrees F. are experienced.

The amount of wind that geraniums will stand is surprising; in fact, as a general rule, it is safe to say that the more open and exposed the situation is the better they will flower. They are lovers of the sun and do best where good drainage is provided, and do not like heavy, wet soils and shady situations. As geraniums will not withstand repeated frosts of over 9 degrees F., and as frosts of such severity are possible throughout winter in most parts of New Zealand, it is necessary to propagate the plants in the autumn and nurse them through the winter to ensure adequate supplies for the flower garden for the following summer.

The plants are usually propagated in the following manner:—

During March the required number of cuttings are taken from the plants in the flower beds or from wherever supplies are obtainable. The best cuttings are those made from sturdy, ripened growths. Ripened growths are those growths which, although young and vigorous, are of sufficient maturity to allow the tissues to become firm and the outer bark or skin to be slightly coloured; soft growths, on the other hand, are tender, more easily bruised, and without coloration to the stem other than the primary green. Such cuttings should be avoided if possible, but may be used in case of necessity.



Geraniums should be propagated in autumn and nursed through the winter. Left—A cutting ready for inserting in a seed tray. The cut has been made just below a joint. Right—A well-rooted cutting ready to be moved to its flowering quarters.

The cuttings, which are about 4in. long, are made by removing the lower leaves and stipules with a sharp knife and then by cutting square across the stem just below but not through a node or joint. When made the cuttings are inserted fairly closely in seed trays about 4in. deep and containing a sandy compost which has been made firm and level and over which has been spread a ¼in. layer of clean, sharp sand. For putting in the cuttings a blunt-pointed dibble of greater diameter than the thickness of the cutting is used. The dibble is inserted to the required depth and on being removed is given a slight twist to form a mould. A little of the sand trickles into the base of the hole and on it the cutting rests when it is inserted. The expert uses the dibble with one hand and, holding the cutting with the other, inserts it quickly as the dibble is removed from the soil; then with the point of the dibble and the forefinger of the other hand the soil is pressed downward and inward toward the base to fix the cutting firmly into position.

[Photo News Ltd. photo.

Violas and pansies are propagated by cuttings in early autumn. The best cuttings are obtained from the soft, vigorous young growths at the base of a plant.

Some gardeners insert the cuttings into trays of damp sand and as soon as the cuttings have rooted pot them up into 3 or 4in. pots containing a richer compost. By using at the outset a compost of half sand and half loam with a little leaf mould added the cuttings can be over-wintered and glasshouse space thus conserved at a time of the year when it is perhaps most needed. Some growers add a little ground charcoal to the compost. This helps to keep the soil sweet and aids in preventing damping off.

When the boxes have been filled with cuttings they are placed in open frames and given a good watering. At this season of the year and under normal circumstances there is no need to use any covering; in fact the cuttings may be exposed to full sunlight without detriment to them. Do not coddle them, but keep them growing as hardily as possible. To protect the cuttings from frost the frames should be closed in the evening, but should be opened again as soon as it has dispelled the following morning.

As winter approaches and the weather becomes more severe the lights over the frames should be covered with hessian as an added protection against heavy frosts. During wet, cold weather the lights should be kept on, but should be lifted a little at one end to permit a free circulation of air. On bright, sunny days the lights should be removed. Watering, of course, should be reduced to a minimum, but the soil should not be allowed to become dust dry.

### Pentstemons

Hardy perennial plants, pentstemons are very floriferous and are most useful for massing in beds, for grouping in the herbaceous border, or for planting in the open spaces in a shrubbery. They succeed in any good garden soil and respond to liberal treatment. In reasonably well-drained situations they will require little attention for many years other than the removal of old and spent growths after the winter is over and just as young growth commences from the base and an occasional topdressing when required. For bedding purposes the plants may be raised annually from seed, but from seed results 100 per cent. true to form and colour cannot be expected. Some named varieties such as Scarlet Beauty and Pink Beauty have to be propagated by cuttings. In addition, if the gardener wishes to retain and increase any outstanding varieties in a batch of seedlings, cuttings of the selected varieties are taken and propagated.

The cuttings, from 3 to 4in. long, are taken from the soft, sturdy, barren shoots (those that are not showing any sign of developing flower buds). The softer the wood the more readily do the cuttings take root. The lower leaves are removed and a cut made just below a joint as recommended for geraniums. When made the cuttings are inserted in a sandy compost in boxes, pans, or pots, well watered, and

## WORK IN THE FLOWER GARDEN . . .

placed in a close frame and shaded from sunlight. They are given the very opposite treatment to that afforded geraniums. The cuttings should be taken on a dull day, never allowed to flag, inserted as soon as they are made, and kept close and shaded until they have rooted. During dry, sunny weather they should be syringed frequently to prevent the foliage wilting and on no account must the soil be allowed to become dry.

### Calceolarias

The hardy calceolarias (the small-flowered yellow and bronze kinds), which form shrubby little bushes in sheltered positions, may be propagated in a similar manner to that recommended for the pentstemons. Care should be taken to use the soft wood and not that which has become hard or woody. The yellow calceolaria may be considered by some to be an "old-fashioned" flower, but it still has its uses. The pure, clear, yellow flowers, which are borne in profusion, are outrivalled by few other plants, and its bronze counterpart is always admired.

### Agatheas and Cupheas

Both agatheas and cupheas, which are sub-shrubs, are hardy in the milder climates, but generally are liable to be severely cut back or killed outright during winter in most districts. Both of them may be easily propagated from soft cuttings at this time of the year. As they are both frost tender, a little mild heat is beneficial during the colder months. Both the agathea and cuphea are sometimes used as edging plants. *Agathea coelestris* has beautiful, soft-blue, daisy-like flowers with a golden disc or centre, and the cuphea or cigar plant has small but conspicuous tubular red flowers with greyish tips. The shape of the flower, with its grey, ash-like tip, is not unlike that of a lighted cigar.

### Violas and Pansies

Violas and pansies are also propagated in a similar manner to that recommended for the pentstemon. The soft, vigorous young growths from the base of the plant make the best cuttings. A method frequently adopted is as follows: In the early autumn as much as possible of the old spent growth is removed; if the soil is inclined to be dry, it is given a thorough watering, and a mulching or topdressing of finely sifted compost of loam, sand, and leaf mould is then worked in and about the crown or stool. The resultant young growths from the base quickly root into the compost and can be removed as what are commonly known as Irishmen's cuttings.

### Other Plants

There are several other half-hardy and tender perennial plants such as the iresines, alternantheras, and fibrous-rooted begonias that can be propagated from softwood cuttings at this season of the year. Such plants, however, being more tender than most of those mentioned above, require more heat than that given in a cold frame.

### Removing Trees and Shrubs

In every garden there comes a time when a tree or shrub becomes too large for or out of place with its surroundings. The removal of such specimens may mean a sacrifice, but frequently they can be used to advantage in another part of the garden if they can be safely transplanted. With a little care and preparation many relatively large trees and shrubs can be safely moved at the opportune time, which is usually from late autumn until early spring.

One of the main essentials to ensure success is to induce the subject to be moved to develop a compact root system. To endeavour to move even a comparatively small tree with wide-spreading roots would be a difficult task. To reduce the amount of earth to a size that would permit transportation many of the roots would have to be cut through, and such drastic treatment, together with the severe check the subject would receive in being moved, might prove fatal to it.

To prepare the specimen in advance of the actual shifting process the following practice is frequently adopted:—

At a distance of 2ft. or more from the trunk (depending on the size of the specimen) a circular trench about 18in. across is opened out and the soil excavated to a depth below the spreading roots, which are cut through as the work proceeds. The larger roots should be sawn through rather than cut with an axe, which is inclined to split them, thus causing more injury than is necessary. After digging has reached below the main root system, which as a rule is about 3ft. deep, the endeavour should be to cut inward to sever the main taproots if it can be conveniently done.

The next step is to refill the trench with the soil that was taken out, removing the pieces of root that were cut away. The soil is tramped firm as the work proceeds, and if the soil is even slightly dry, it should be given a thorough soaking. Naturally the tree will receive a check, but if the work is carried out early in March, it should have no serious effect; moreover, what is most important, the tree in an endeavour to recover will develop a new root system. Small fibrous roots will push out in every direction from the severed roots and will bind the soil more compactly about them. Then, at any time from the end of May onward to spring, the trench can be reopened and the removal completed.

With difficult subjects the work of wrenching or preparation is sometimes carried out 12 months in advance of the actual removal.

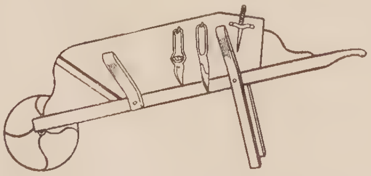
### Other Work for the Month

Where the ground is in readiness the planting of such spring-flowering bulbs as narcissi, tulips, and hyacinths can be carried out. Preparation should be made for the composting of fallen leaves and garden refuse, of which there will be plenty the following month. Wallflowers and similar plants should be wrenched in readiness for planting in April.

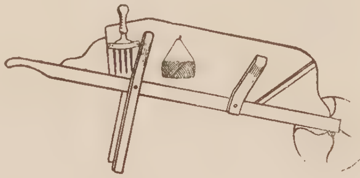
## Making a Wheelbarrow More Useful

WHEELBARROWS are probably one of the most useful tools used in the garden or on the farm. Their usefulness may be greatly increased at practically no cost by following the suggestions given in this article.

On one side of the barrow (handle end) nail a piece of leather about 3in. x 1in. to hold a knife. A little further along on the same side screw in two hooks to carry a pair of secateurs and a pair of grass shears.



On the opposite side of the barrow nail another piece of leather about 5in. x 1in., bowed out, not flat; this is to carry a garden hand fork or trowel. Further along screw in a hook to carry a roll of twine.



Sizes of leather straps could be made to suit any particular tool, and other straps or hooks could be added to suit the gardener or farm worker.

If the barrow is a metal one, a strip of wood about 3in. wide, 1 ft. long, and 1in. thick could be riveted to each side of the barrow on which to fix the leather straps and hooks.

The use of this simple addition to the barrow for the small tools suggested (or others as required) will prevent tools getting lost, mislaid, or covered over by weeds, as they so often are if they are laid on the ground when not in use.

—*D. S. ROBINSON, Apiary Instructor,*
*Department of Agriculture, Hastings.*

# THE MUSEUMS OF NEW ZEALAND

*IN the last article in this series Enid B. V. Phillips described three provincial museums—the Mission House at Tauranga and the Southland and Hawkes Bay Museums. This month she deals with a smaller museum in a district with one of the most colourful histories in Otago—*

## The Lakes District Centennial Museum, Arrowtown

TO the passing traveller probably the most outstanding characteristic of picturesque little Arrowtown, set on a sunny flat of the Arrow River and sheltered by the steep crags and rocky couloirs of the Crown Range, is its utter peacefulness, doubtless due in some measure to the paucity of speeding traffic and the resultant cacophony of sounds which typify the too-swift tempo of modern life. Planted in the main street some 82 years ago by the tree-loving pioneers, the tall English trees—an avenue of leafy jade in summer, an intricate filigree of silvery branches encircling the winter sky—also contribute to the tranquillity of the scene; the first sapling was named after the youngest spectator of the planting, the 2-year-old daughter of one of Arrowtown's earliest settlers.

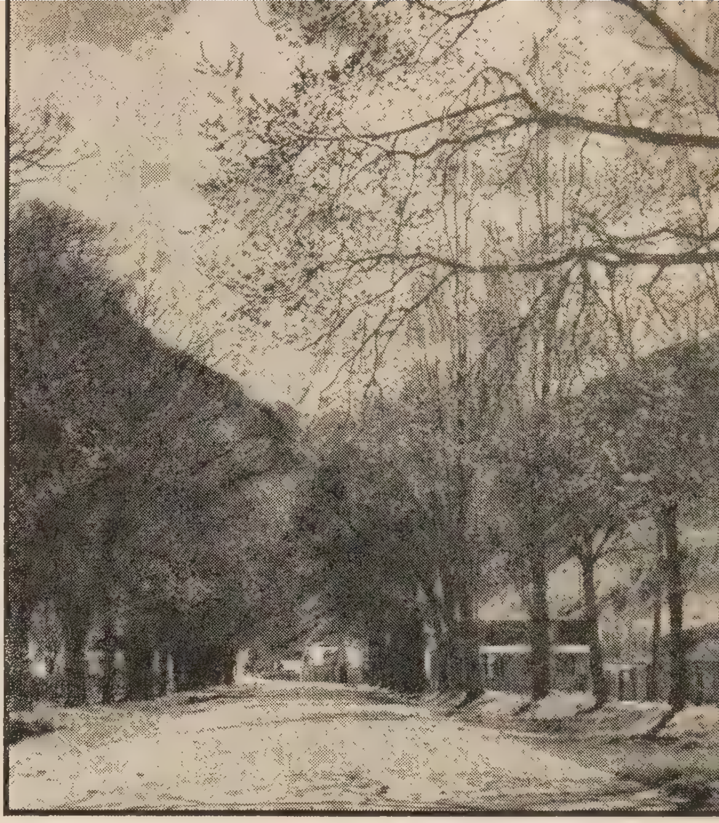
But there is nothing lethargic about this contented community itself; on the contrary, the sturdy spirit of the pioneers is still as strong in the second and third generations today as it was in their forebears nearly a century ago. This is clearly demonstrated in the case of their most recent enterprise, the collection and preservation of relics pertaining to the early days in Lake County. The suggestion was Sir Joseph Heenan's (he was then Under-secretary of Internal Affairs), the occasion a meeting of the Arrowtown Progress League early in 1948, when the business was followed by a period of friendly informality peculiar to district functions.

League members thought so highly of the idea that they decided it should be a district scheme and called in the Queenstown Borough Council, the Lake County Council, and the Arrowtown Borough Council to co-operate, representatives of the various bodies constituting a special committee to establish a museum.

### Antiquated Iron Lamps Modernised

Arrowtown's Mayor, Ernest Thompson, was appointed chairman, a popular choice, for Mr. Thompson combines a reverence for the past with a realistic appreciation of the advantages of modern progress, as is proved by his purchase of a pair of antiquated iron lamps whose flickering flames, fed by kerosene, had lighted the town's central street until just over 4 years ago, and wiring them for electricity before placing them in the plot of garden fronting his home. Moreover, the year 1948 coincided with the centenary of Otago, and what could be a more suitable chance to commemorate such an event than to call the proposed museum the Lakes District Centennial Museum. Preparations for the 75th anniversary celebrations of the Arrowtown Borough on January 6, 1949, were also in train (for although the township was the premier mining settlement in the Wakatipu district, it did not become a borough until 1874), so it was deemed a propitious date for the official opening of the new museum—an extremely ambitious undertaking considering that as yet the committee had no building, no equipment, and few exhibits.

Nothing daunted, however, they commenced their campaign. Financial aid from the different local bodies was augmented by a generous grant from the Government, and the donation of a room belonging to a now defunct Oddfellows Lodge solved the housing problem. The quiet street resounded with the rasp of saws and the thud of hammers at all hours as a willing army of amateur carpenters supplemented the contract labour, ripping out the old floorboards and substituting new ones, improvising show cases, and installing shelves and display stands. Those who prided themselves on their ability to wield a paint brush found the old building provided plenty of scope for their energies.



[*National Publicity Studios photo.*

**The tree-lined main street of Arrowtown, "an avenue of leafy jade in summer, an intricate filigree of silvery branches encircling the winter sky."**

Meanwhile the secretary, Mr. J. H. Douglas, had circularised every household in the district, and documents, photographs, mineral specimens, primitive implements, utensils, and articles with historical associations began to pour in. By early December the business of tabulating and cataloguing the exhibits began in earnest—a big task, as most of the original owners were dead and it was difficult to obtain sufficiently detailed information concerning some of the items, but the committee persevered and in nearly all cases were successful. And always they had the interest of Sir Joseph Heenan and his Department, this assistance being happily continued by Sir Joseph's successor, Mr. A. G. Harper. The little museum made a brave showing indeed on opening day, the official ceremony being performed by Mr. T. L. Macdonald, M.P.

### Gold Mining Given Prominent Place

As is to be expected, a prominent place is given to exhibits pertaining to the precious metal which lured prospectors hither by the hundreds in the 1860's—a sample (approximately 10 pennyweights) of the type of gold found "strewn among the surface gravels like beans and peas" by the first miners at the Arrow; a pair of solid-brass scales (replacing the more primitive method of pannikin measure) which have weighed a considerable portion of the wealth that poured in from all parts of the diggings; a miner's right; an old-time cradle wherein the gold was washed from the river silt; and a box made of steel plate, measuring 12in. x 8in. and standing 8in. high, with a hinged lid secured by four big bolts and a hasp in lieu of a padlock, which was one of the receptacles used by the armed escorts to convey the gold to Dunedin.

There will always be controversy about whether the honour of being the first to discover gold at the Arrow were the ex-sailor William Fox and his partner, John O'Callaghan, or the Taieri ferry-keeper John MacGregor and his companion Thomas C. Low. Suffice to say they all shared in the secret of the hidden ravine and reaped such riches from the swirling waters that other miners became suspicious of this sudden prosperity. Their investigations soon revealed its source, and so the rush to the Arrow began (incidentally resulting in a shortage of shearers on the station of W. G. Rees, the first squatter on the south shore of Lake Wakatipu where Queenstown now stands).

The Lakes District Centennial Museum.

The conglomeration of calico tents at the new diggings continued to be called "Fox's" for a considerable time, but afterward the township took the name of the river whose bank formed its boundary. Fox, having accumulated a sizeable fortune, prudently turned publican, bestowing upon his hotel the rather apt title of "The Golden Age." He displayed a further unsuspected flash of poetic insight in his farewell address to the local sergeant-major of police, who left the town to enter the hotel business and to whom Fox presented a ring fashioned from gold he had reclaimed from the rocky fastnesses of the Arrow River.

### "Gaol" Carried Away

As there was no gaol at that period, lawbreakers at the Arrow were punished by having irons locked round their legs, these irons being attached to a couple of stout chains about 2ft. long which were secured to a heavy log by an eyebolt. The tale associated with the pair of leg irons on display in the museum concerns a giant Jamaican native whose exceptional strength was his pride. The constable who arrested him for his misdemeanours duly manacled him to the log and departed on duty. When he returned some hours later he found the prisoner had decamped and after a long search discovered him in a nearby hotel with the log nonchalantly balanced on his shoulder while he disposed of a long beer. Having succeeded in working the "bracelets" up his legs, he was able to pick up the log and carry it as a less muscular man would a lighter load.

Even after a lock-up was built it was a long time before a magistrate was appointed, and as the customary Bible for use in the courthouse was lacking, the warden perforce had to borrow one. A resolution recorded in the minutes of the first meeting of the Arrowtown Borough Council in 1874 dealt with "the disgraceful state of the Arrow public gaol" and the need to take action in the matter.

Subsequent hotel proprietors in the fast-growing township followed Fox's lead in the matter of imaginative nomenclature, and the main street featured a "Morning Star" as well as an "Evening Star," although the nostalgic reminder of Louisiana's largest river city, the "New Orleans," was offset by the stolid British patriotism of the "Royal Oak." The feud between American-born Captain W. H. ("Bully") Hayes, of the "United States" hostelry (he afterwards found it politic to change its name to the "Prince of Wales"), and Con Buckingham, host of the "Provincial," created quite a furore in the little mining centre, and his marriage with Rosie Buckingham did nothing to mend matters, the girl's father revenging himself by resurrecting some of the old scandals concerning his son-in-law.

Marriage could not have been a very halcyon affair for the unfortunate Rosie and perhaps it was all for the best that Providence put an early end to her problems, for she and her baby were drowned in a boating accident the following year at Nelson, whence the captain had removed with his family to obtain a brief respite from reminders of his past. An account book dated 1863, which belonged to an Arrowtown storekeeper at that time and which is now in the keeping of the museum itemises several articles charged to the Hayes's menage. (The shops in Arrowtown, by the way, outnumbered the hotels by two to one.)

Another interesting item is the sketch book in which the artist Andrew Hamilton pencilled his impressions of the lakes district during his travels through the goldfields in 1869.

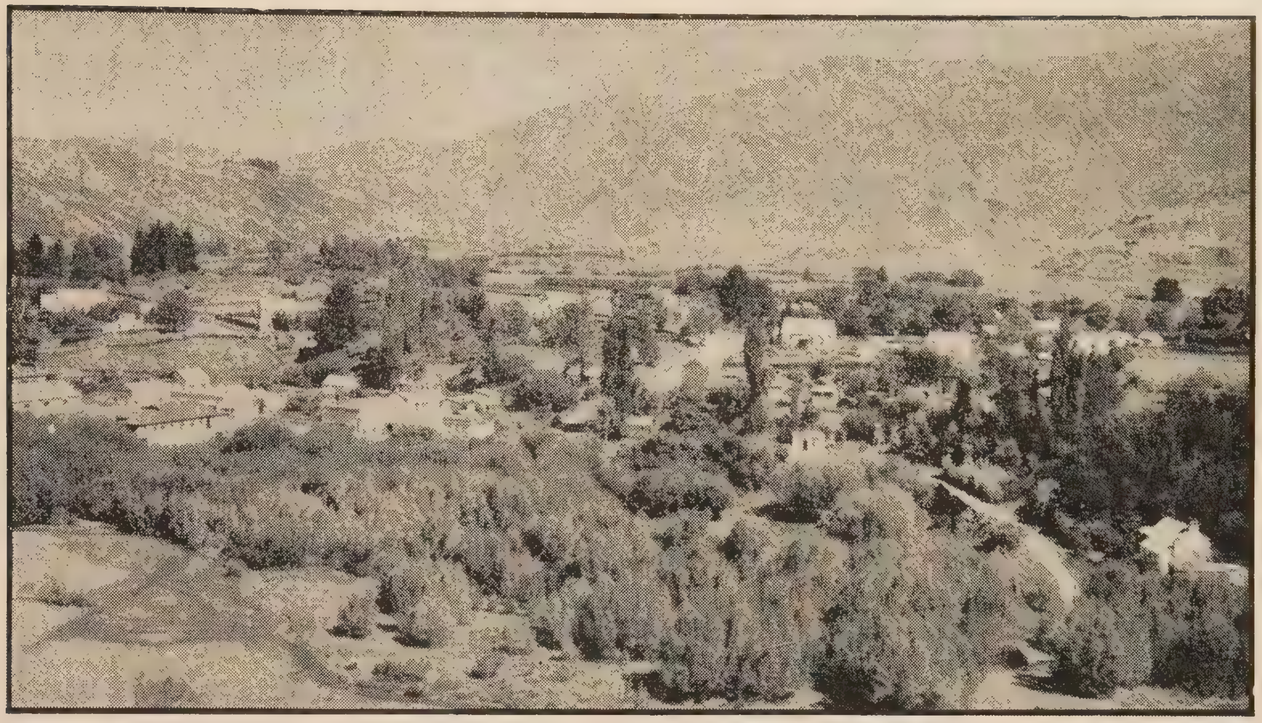
### Spinning Wheel 100 Years Old

One of the museum's oldest exhibits is a spinning wheel manufactured well over a century ago and brought out from the Orkney Islands by an old lady who used it for many years to spin the yarn for the socks and stockings she made for her friends and neighbours at the Arrow. Close beside it is a candle mould, which was once in common usage, it being a cardinal rule in pioneer households to save up all the fat and with the aid of cotton wick contrive sufficient candles for domestic needs. They made their own butter, too, and any surplus was sold to the stores.

Most housewives had a butter mould holding precisely 1lb. like the one displayed in the museum, the only difference being the variation in the pattern on the lid, which was pressed down and imprinted the emblem on each pat. This served the dual purpose of

*[National Publicity Studios photo.*

Gold was found by the first miners in the Arrow River "strewn among the surface gravels like beans and peas."



[*National Publicity Studios photo.*

Arrowtown, with the Arrow River in the foreground. The Crown Range is on the left.

pleasing the eye and acting as a trademark, and people soon became accustomed to picking out the best butter by the particular design it bore. Another convenient device is the fireside crane, comprising an iron bar bent at right angles and hinged at the side of the fireplace so that the saucepans could be swung away from the open flames while the cook attended to their contents.

[*National Publicity Studios photo.*

Washing gold from river silt with a cradle, a method used by the early Arrowtown miners.

## Immensely Practical Women

Save for a spectacle case of English filigree silver complete with chain and hook to attach it to the belt much in the same manner as the mistress of the manor carried her keys in medieval days, these feminine relics all point to the fact that the wives of the pioneers were immensely practical women, although many of them had come from well-to-do English homes where they were not expected to perform any more menial tasks than arrange the flowers, do exquisite embroidery and petit point, paint conventional flower pieces and landscapes in water-colours, play the piano pleasingly, and perhaps sing the sentimental songs of the day. Yet so well did they adapt themselves to the primitive conditions imposed by life in a new country that not even the vogue for crinolines, which were so much the mode during a part of Victoria's reign, hampered their capabilities one whit, as witness the incident when a mother plunged fully clothed into a waterhole to rescue her small son from drowning. Her hooped skirts, ballooning out around her and fulfilling the function of a lifebelt, kept her buoyant until she reached the bank with her terrified burden. The able-bodied men in the vicinity were apparently too paralysed by the weight of their boots to take swift action.

Comeliness was no criterion of romance in mining communities such as Arrowtown. Indeed, the gold-diggings in the early days might almost have been described as a spinster's paradise, for even the most unprepossessing old maid could become affianced in a fortnight, and her more favoured sister could select her spouse from a score or so of importunate suitors eager to wed her immediately.

The elaborate stitchery on the lady's side-saddle which was donated to the museum imparts a decorative touch that is missing in many another utilitarian exhibit. The saddle had been so excellently cared for that its owner was evidently an expert horsewoman, not like the poor little Arrowtown bride who had been on a horse only twice in her life and who, after the wedding festivities had been celebrated, had to ride over a circuitous mountain path honeycombed with creek crossings to a northern mining settlement before her young husband could carry her over the threshold of their new home.

Babies, too, were often borne from one remote region to another on horseback, seemingly no worse for the long journey in a packing case suspended on one side of the horse and balancing the goods loaded on the other side in much the same way as a Chinese coolie conveys his vegetables to market in two baskets hung one on each end of a pole across his shoulders.

However, not all the pioneers were lucky enough to possess a pack-horse and there are many instances of women walking incredible distances and carrying a young child as well. Naturally, the offspring of such parents were a hardy breed, and the Arrowtown school boasted numerous pupils who thought nothing of trudging 3 to 5 miles to school and back on foot even through the heaviest of snowdrifts, and many of them had to help with the milking and other chores at home in addition.

Residents at the Arrow have invariably been most fortunate in the matter of medical help; the redoubtable Dr. J. Douglas, whose name will never be forgotten throughout the lakes district, started his practice there in 1862, with a tent for a surgery. Stories of his unsparing efforts to succour the sick are legion—crossing icy rivers on horseback, riding over treacherous mountain tracks to tend an injured miner in some isolated gorge, or driving long distances in the darkness in the face of a blizzard. The good doctor deemed such everyday hazards of little importance where the care of his patients was concerned.

## Social High Light

The annual hospital ball used to be a social high light, patrons having the pleasant assurance of assisting the institution's funds and at the same time receiving the promise of medical treatment either for themselves or any of their children up to 16 years of age without further payment. Dancing was one of the favourite forms of recreation in Arrowtown, the local residents being so keen on this pastime that they thought nothing of walking a dozen miles up the winding river road, which had to be forded in a score of places, to attend the dances at the next settlement, and the Macetown miners were equally ready to return the compliment.

Visiting theatrical companies could always be sure of an appreciative audience and when there was a dearth of travelling shows the township's amateur actors banded together and put on a play themselves albeit they had to contend with the young blades' addiction to audible comment and the continuous consumption of sweets, neither of which noisy occupations could be classed as helpful to the players. The Presbyterian Church contributed its share toward the entertainment of the community in the 80's by the introduction of the soirée, a kind of concert followed by light refreshments and an opportunity for conversation. Reposing in a corner of the museum is an ancient phonograph with a horn shaped like the chalice of some gigantic lily, signifying yet another stage of progress in the old-time sphere of amusements at the Arrow. Life may have been hard in those days, but it was seldom dull.

One of the most noticeable features of the Lakes District Centennial Museum is the multiplicity of photographs, some set off by severely plain wooden beadings, a few framed in elaborate gilt, and others arranged in albums or mounted on cardboard. Whatever their setting, these portraits of the pioneers and their wives, attired in the quaint fashions of a past century, make a noteworthy display. May the generations to come revere their memory and treasure these irreplaceable relics of the men and women who did so much for the lovely lakes district.

# Work the Housewife Can Do Sitting Down

### By NORMA K. METSON, Rural Sociologist, Department of Agriculture, Wellington.

**MODERN kitchens (or old ones remodelled) are now planned to save steps, but housewives are still busy people, and there is no reason, except that strongest of all, force of habit, why they should not try to conserve even more energy in the course of their day's work. "Never stand when you can sit" is no lazy woman's philosophy—it is common sense.**

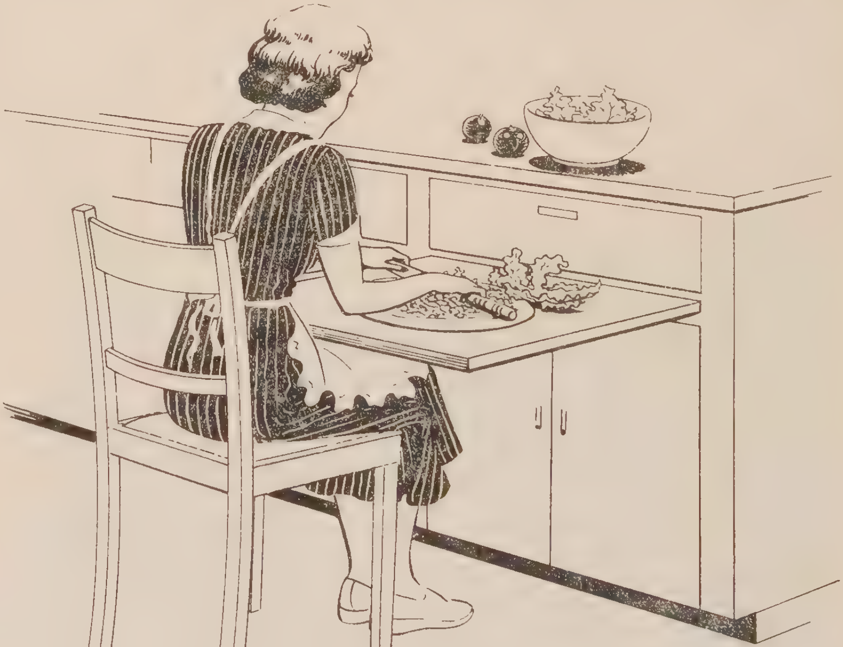
TO save unnecessary stooping in jobs which must be done standing up kitchen benches are now made higher, and though that is desirable, the absence now in many kitchens of big, low meal tables over which much work was spread, means there is often no place where it is possible to sit and work comfortably. There are two possible solutions.

One is to include in a handy location, as at the sink or baking bench, a pull-out board about 24in. from the ground. (Just high enough to clear the thighs when the worker is seated with feet flat on the floor.) It will fit in neatly between the lower cupboard and the upper drawers. This is a comfortable height for use with an ordinary kitchen chair, and the housewife's arms will not have to be strained, as when shelling peas into a saucepan or cutting fruit for fruit salad—tasks which take a considerable time.

The second solution is to have a high stool—but it must be comfortable—with back and foot rest at the correct heights. It must also be light enough to move easily and able to be stored in the work centre itself, not across the room. A home handyman, perhaps, could cut down the back and block up the legs of an ordinary kitchen chair. With this stool dish washing, vegetable preparation, and other sink jobs can be done at a bench 3ft. or more high.

Ironing, provided the table or board is not too wide, is another possible sit-down job. With a heat-controlled iron and clothes that have been damped or dried to the right degree it is not necessary to press with the whole weight of the body; the heat and weight of the iron should be allowed to do the greater part of the work.

Sitting down for a few minutes with pencil and paper early in the day to make lists and jot down menus may also save a lot of mental disorganisation later, trying to remember one set of facts and not to forget another. Though menus written out may not be adhered to strictly, they will save frantic last-minute decisions. Often, if there is a handy couch or window seat, a quarter of an hour spent lying down will literally "do more work" for the housewife later in the day than the same time spent at some trivial task.



A pull-out board inserted in a bench makes a comfortable lap table for work when seated.

# Removing Stains from Washable Materials

**THE weekly washing is a task which probably few housewives enjoy, even if they have a washing machine and plenty of hot water, but it is certainly a cause for greater satisfaction if, when the work is completed, sheets and table cloths are snowy white and the lines of washing free from unsightly stains. Stains usually occur on such frequently-washed articles as table cloths, cotton smocks, overalls, and handkerchiefs, and this article by Evelyn E. Moore, Rural Sociologist, Department of Agriculture, Palmerston North, describes the ordinary household methods which are sufficiently quick and efficient to be practicable for the busy housewife, as well as some chemical ones for removing stubborn stains.**

[*Sparrow Industrial Pictures Ltd. photo.*

REMOVING stains from fabrics with fugitive colours, expensive suits, and other goods usually sent to a dry cleaner presents special problems. Often such stains are better left for the cleaners to remove, but when they occur on otherwise clean garments or on draperies and furnishings the housewife will wish to remove them herself if possible. Methods of treating such stains, and methods of removing medicine stains, which also often require special treatment, will be described in a second article in next month's "Journal."

## Quick Action Advisable

The first rule in spot or stain removal is to attack it at once, when water or an absorbent material such as blotting paper or a paste of fuller's earth or mustard may be all that is required to remove the stain. However, stains cannot always be removed immediately, and some, particularly mixed food stains, require correct treatment if they are not to be "set" into the fabric and made almost impossible to remove later.

Therefore, it is inadvisable to press a garment which, it is suspected, has had something spilt on it without first examining it carefully, for not only may the stain be set more firmly into the fabric, but it may also be made more obvious.

## Reactions of Fabrics

Though stains can generally be removed from all types of washable articles, sometimes it is necessary to know the exact nature of the yarn if the fabric is not to be weakened or rotted. Most people are aware of what treatment can be applied to the natural fibres—cotton, linen, silk, and wool—but they are less certain of the nature of the two varieties of rayon, viscose rayon and acetate rayon, and of nylon. Perhaps the burning test is the easiest method of distinguishing them.

**Viscose rayon** burns easily, like cotton or linen, to form a fine, white ash, and, except that it is more reactive and therefore requires more care, usually may be given the same stain-removal treatments. It may be boiled if necessary, provided it has been tested for colour fastness, and usually it does not water spot or shrink badly unless a special or crepe finish has been used. Boiling silks, most artificial linens, spun rayons, and occasionally knitwear fabrics are made from this fibre.

**Acetate rayon,** on the other hand, burns with a pungent smell to form a black, bead-like ash which becomes hard on cooling. Usually it is possible to test the material quite easily by pulling threads from a seam or snipping a small piece off a seam or hem. As many fabrics are now made of a mixture of two or more textile fibres, it is advisable to test both crosswise and lengthwise threads. Acetate rayon is easily melted by heat and most people are unhappily aware of the glazed, crinkled, or even completely melted patches which too hot an iron produces on the fabric. Delustred acetate rayons also water spot very readily; therefore, though they may be ironed slightly damp, they should never be sprinkled with water and ironed directly, or glazed patches which are difficult to remove will be formed. This type of rayon cannot be boiled or it melts partially and permanent creasing occurs. It is quickly dissolved by acetone, a solvent contained in nail-polish remover and often used with safety to remove grease or varnish stains from other fabrics. The delustred acetate rayons are affected also by methylated spirit, which causes the fabric to revert to its bright state. Acetate rayon probably is used most frequently in lingerie fabrics, satin-back crepes, taffetas, and some rayon crepes and printed novelty silks.

**Though when buying fabrics it is not always possible to be sure of the nature of the fibres used, pure silks, linens, cottons, and woollens usually are labelled as such, so that the absence of a label is a fair indication that the material is at least partly rayon.**

**Nylon,** being somewhat water repellant, is also stain resistant, and stains treated promptly usually can be removed by washing in warm, soapy water. Like acetate rayon, it should not be boiled or ironed with a hot iron, though acetone and other grease solvents may be used on it with safety.

**Linens and cottons** are not weakened by any of the normal stain-removing processes, though the careless use of hydrogen peroxide and acids which are allowed to dry on the fabric will destroy them.

**Wool and silk,** on the other hand, are scarcely affected by hydrogen peroxide and acids, but are very easily weakened and yellowed by chlorine bleaching solutions and alkalis, such as washing soda.

## Types of Stains

Stains on washable articles may be classified according to the methods used for their removal into three main groups:

Stains removable by solvents (such as carbon tetrachloride) and washing.

Stains which may require bleaching for their complete removal.

Stains requiring treatment with acid.

## Solvents and Washing

**Oil, grease, and wax** stains probably are among the most frequent in the weekly wash and, though their removal usually is not difficult, some grease stains, such as those of car and machine oil, axle grease, or candle wax, are not removed easily by washing alone. Their removal is facilitated by pressing the fabric, with a warm but not hot iron, between two sheets of good-quality blotting paper, which absorbs much of the grease, or by rubbing the stain well with a little olive oil or soft fat, which softens it and makes it much easier to wash out with hot soapy water. Eucalyptus oil or camphorated oil dabbed on stains has a similar effect. Alternatively the stain may be dissolved in a cleaning solvent such as carbon tetrachloride or petrol before the garment is washed. Being non-inflammable, carbon tetrachloride is preferable, but this treatment usually is not necessary for washable articles.

**Paint and enamel** stains when quite fresh often can be removed by rubbing a good soap lather well into the fabric. If they are not, treatment with turpentine, followed by thorough washing with hot, soapy water, is usually successful. The best method is to place the stained portion over a pad of clean, soft rag, which will absorb the excess turpentine and paint, and rub it gently with another rag soaked with turpentine. Older paint stains are often softened and dissolved by acetone (nail-polish remover) and then removed by thorough washing with hot soapy water, though old green-paint stains rarely can be removed completely. Cellulose paints such as nail varnish are also removable with acetone.

**Tar or creosote** stains are best treated with coal-tar benzene (not petrol). If this is not available, lard, fat, or petroleum jelly may be rubbed into the stain to soften it and left for several hours; treatment with carbon tetrachloride or petrol will then take out most of the stain and the rest should be removable by washing with hot, soapy water. Old tar stains may require a further treatment, as they are very difficult to remove.

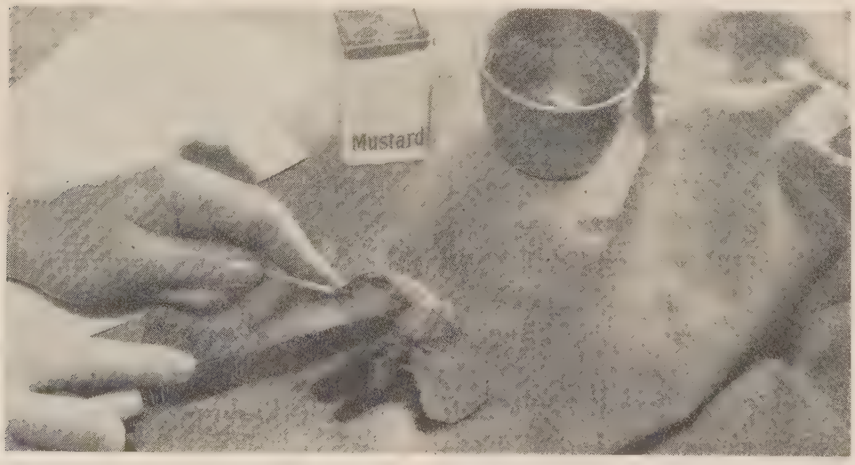
**Cod-liver oil** stains are often a problem on babies' clothing. When fresh they are often unnoticeable, but once they have dried they become yellow and difficult to wash out. Consequently, they should be treated as soon as possible with an oil solvent such as carbon tetrachloride if washing immediately in warm, soapy water is impracticable.

**Non-greasy stains:** When stains on washable fabrics are not of an oily or greasy type, the first treatment is to blot up or absorb as much of the substance as possible before it soaks into the fabric. Rinsing with cold water will then often remove the remainder of the stain. It should be applied as quickly as possible, especially when a chemical substance is spilt on the fabric, even if it does not leave an immediate stain. Anti-perspiration cosmetics, bleaching solutions, dye-stripping powders and solutions, hydrogen peroxide, iodine, and many other chemicals may all rot fabrics if left to dry on them, but when thoroughly rinsed out immediately have a negligible effect.

**The milder "household methods" should always be tried on stains first, for, provided the article is washable, they are completely safe under all conditions. Stubborn stains may call for chemical treatment which requires almost a special technique needing great care.**

## Stains which may Require Acid Treatment

**Blue writing inks:** Most blue-black writing inks consist of two ingredients —a dye and an iron salt of tannic acid which becomes permanent only after drying into the paper or fabric. Immediate treatment with blotting paper, followed by a thick mustard-and-water paste, or even salt, though it is less satisfactory, often removes practically all the ink from carpets, rough tweeds and woollens, and even from cottons, linens, and other lighter materials. The remaining stain usually can be removed by rinsing and treatment with thick, soapy suds. For older stains chemical treatment is often required, though soaking in equal amounts of lemon juice and salt, following by bleaching in sunlight and rinsing, may be successful.



[*Sparrow Industrial Pictures Ltd. photo.*

Applying mustard paste for the removal of ink stains.

## Stains which may Require Bleaching

**Coloured inks** are of various types and differ greatly in their responses to stain removers. If treatments for blue-black inks fail, another may be successful. One type of red ink is easily removed from cotton, linen, and rayon by rinsing in boiling water or by pouring boiling water through the stained fabric stretched over a basin. Soaking in cold and very weak ammonia for several hours will often extract types resistant to that treatment, and still another type is soluble in methylated spirit. Finally, they may be removed by bleaching with chemicals.

**Marking inks** often respond satisfactorily to immediate rinsing with cool water. A preliminary treatment with a solvent such as methylated spirit may assist.

**Indian ink and printer's ink:** Indian ink is a mixture of pigment and gum and printer's ink a mixture of pigment and linseed oil. Provided the stains are dealt with promptly, they can often be removed almost completely by intensified washing. Probably the best treatment is to rub the dry stain thoroughly with solvent soap. (This may be made at home by mixing 1 tablespoon each of turpentine and soap with 1 teaspoon of methylated spirit, warming the mixture in a basin of hot water, and stirring until a clear paste is formed.) It should be left about half an hour and the soap then washed out by vigorous rubbing or scrubbing with warm water. It may be necessary to repeat this treatment and to follow it with bleaching to remove all traces of the stain.

**Other pigments:** Stains caused by grass, carbon paper, embroidery transfer ink, shellac varnishes, and especially ink pencil are usually more easily removed if not treated with water first. In fact, water spreads ink-pencil stains and makes them more difficult to remove. Methylated spirit is among the most effective materials. The stain should be placed over an absorbent pad and sponged gently, or allowed to soak in the methylated spirit. Washing in hot, soapy water may be necessary to remove the remainder of stain; it is essential for grass stains. Other solvents such as carbon tetrachloride may also be used.

**Lipstick, nail polish, and tobacco:** Lipstick is usually removable by washing or the use of a solvent followed by washing. However, some types are more difficult to remove, and these, together with nail polish and tobacco stains, are often removed with acetone (nail-polish remover). Acetone cannot be used on acetate rayons, but amyl acetate is an effective substitute and is obtainable from chemists.

**Food and blood:** Food stains, including tea, coffee, cocoa, other beverages, fruit, soup, and ice cream, are the most easily removed when fresh, but often the most difficult if they have been treated carelessly—boiled or ironed into the fabric or left to become dry and hard. With the exception of fat or oil stains, which wash out quite easily with hot, soapy water, all food stains should first be soaked in cold water. When the stain is fresh this will often remove it completely; if not, it does remove the sugar, starch, and particularly the soluble proteins (present in milk, for example), which otherwise may be set into the fabric as a permanent stain if it is ironed or placed straight into boiling water in the copper. After the fabric has been rinsed, washing in hot, soapy water, boiling, or pouring boiling water on to the stained material stretched over a basin often removes the rest of the stain. The removal of dried blood stains is often facilitated by soaking over night in salt solution. Old food stains which have proved resistant to other treatment are sometimes dissolved by glycerine; when the fabric is dry, apply the glycerine, soak it over night, and then shampoo it in strong suds. Finally, chemical treatment, either with acid to remove the residual iron from blood stains or with a bleaching agent, may be required.

**Dye** stains often require chemical treatment. However, sometimes dyed fabrics stained with perspiration or acid foods such as salad dressing or vinegar change colour and remain changed even after the other stain has been removed. In such cases dabbing on a weak ammonia solution and then rinsing in water usually restores the colour. Soaking in methylated spirit and ammonia (5 drops of ammonia to an egg cupful) effectively removes some dye stains.

## Bleaching in Sunlight

**Scorch marks:** Probably every housewife knows that scorch marks, unless they are very severe, quickly disappear when the article is spread out in bright sunlight. It is also certainly of benefit in whitening the wash, sun-dried clothes frequently being noticeably whiter—no matter what soap may have been used—than their counterparts dried in airing cupboards.

**Mildew:** Perhaps less well known is the effect of sunlight on mildew stains. The material should be moistened, a good coating of soap rubbed on to each stain, and then the material spread out in the sunlight for one or two days, the stains being remoistened occasionally. Washing well with hot, soapy water should then remove most of the stains, though prolonged treatment may be necessary when staining is severe.

## Chemical Treatments

**Stains on washable articles often may be treated chemically with success where milder treatments have failed. Provided the chemicals are used in the correct concentrations and only on fabrics for which they are suitable, and that the garments are rinsed thoroughly in three changes of clean water afterward, the fabrics are not rotted or weakened in any way.**

*[Sparrow Industrial Pictures Ltd. photo.*

Holding a cloth moistened with oxalic acid solution over a saucepan of boiling water to remove rust stain.

However, it is always advisable to test the effect of the chemical on a small, inconspicuous part of the garment such as a seam, for many otherwise fast colours are quickly destroyed or changed by bleaches and other chemicals.

Chemicals which are reasonably safe and easy to use and which are available include oxalic acid and its potassium salt (salt of lemon), used for the removal of ink and iron stains; sodium hydrosulphite, usually sold under a trade name as a dye-stripping powder; hydrogen peroxide; chlorine bleaching liquids, also usually sold under a trade name; ammonia, and dilute sulphuric acid (10 per cent. strength). They are all poisons and should be labelled carefully and kept apart from medicines and foods.

### Oxalic Acid and Salt of Lemon

For the removal of residual ink stains and iron stains on fabrics oxalic acid and salt of lemon are the most efficient chemicals.

If there are only one or two stains on cotton or linen materials, the stains may be dampened with a solution made by dissolving ½oz. of oxalic acid crystals in 5 cups of warm water and held directly over the spout of a kettle of boiling water, when the steam should quickly bleach the stain. Otherwise the articles, after the removal of metal buttons or fasteners, may be immersed in the solution in a glass or earthenware, but not a metal, bowl, soaked for not longer than 15 minutes, and then rinsed thoroughly. If a pale blue stain which will not wash out in hot, soapy water still remains, it may be removed by one of the methods for bleaching.

### Bleaching by Chemicals

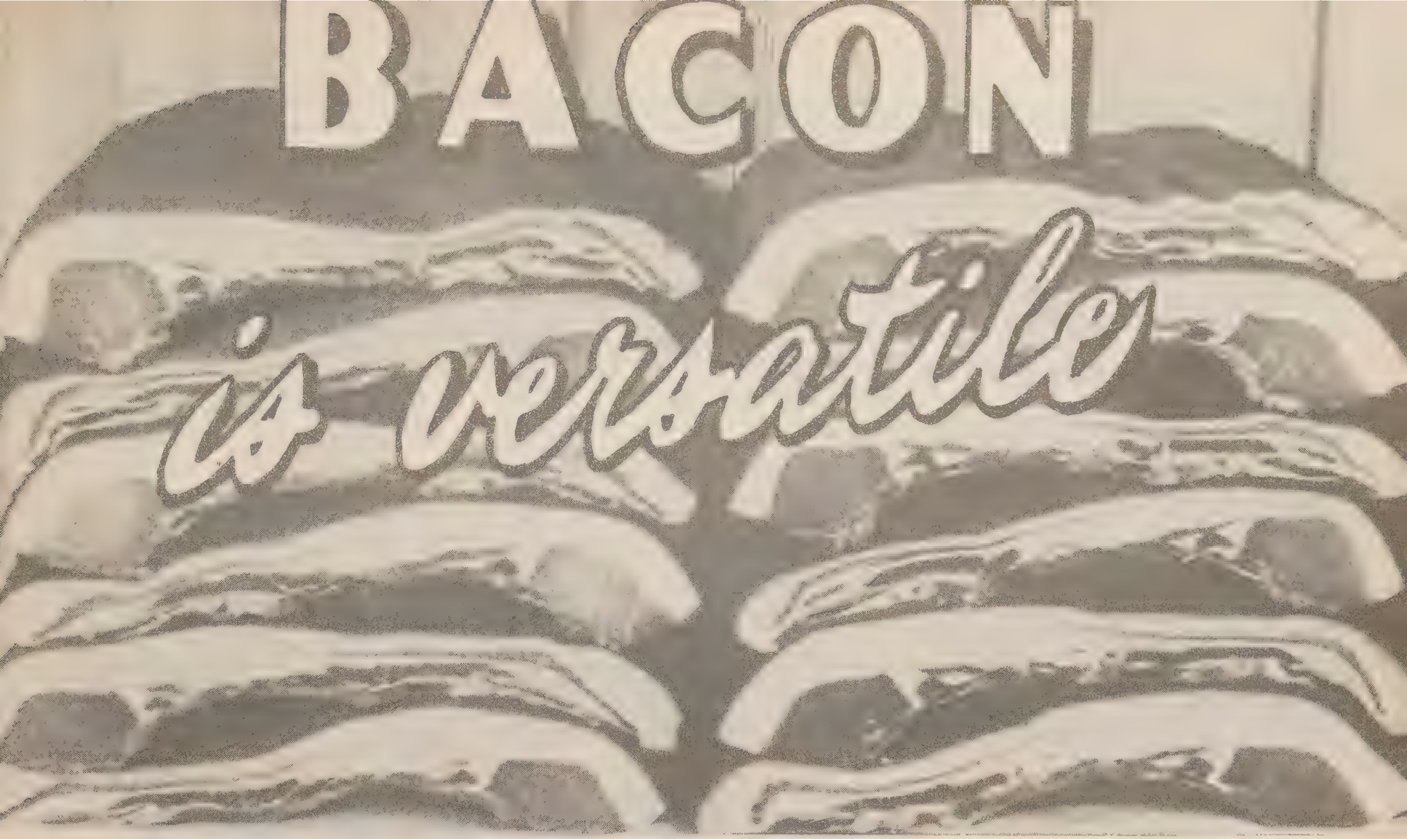
Old fruit, tea, or coffee stains, dyes, mildew, and residual stains which have proved resistant to other treatment may be bleached out of white or fast-coloured fabrics, but this method cannot be used on coloured articles which are not fast to boiling.

One of the dye-stripping powders should be tried first. The stain is wetted and a small amount of the powder sprinkled on and patted in. This removes dye stains as well as some fruit and coloured-ink stains. If it is desired to treat the whole article, all metal parts and buttons are removed and the dye stripper dissolved in very hot water in an earthenware bowl, using 1 or 2 teaspoons of powder to each pint of water. The article is immersed and worked about with a wooden spoon or stick. After a few minutes, if the treatment is ineffective, or after bleaching has taken place, the article is removed and rinsed thoroughly. If it is then found that the "fast colours" on table linen or other goods have been faded or changed somewhat, rinsing with weak ammonia usually restores them. Second, the ordinary 10 volume hydrogen peroxide, diluted with three times its volume of water with a trace of ammonia added, may be used directly on the stain; or, diluted with 10 times its volume of water, it may be used for general bleaching of the whole article, and materials may then be immersed safely for 2 or 3 hours if necessary. This method is sometimes used to remove the last traces of ink stains. Thorough rinsing after treatment is essential.

Finally, one of the proprietary lines of chlorine bleach may be used if desired, but only on cotton, linen, or rayon. Usually adequate instructions are provided, the liquid being diluted with 10 times its volume of water and dabbed on the stain. If no bleaching has occurred after 2 minutes, a small amount of weak acetic acid (white vinegar) may be dabbed on the stain, followed by some more bleach. If no bleaching has occurred after 2 minutes, or as soon as bleaching is effective, the material should be rinsed thoroughly.

BACON AND BAKED BEANS
SUPPER SPECIALS
BACON AND TOMATOES
BROILED BACON

# BACON *is versatile*



**BACON is the most versatile of meats. It can be a main dish or a perfect accompaniment to other foods. It is welcome for breakfast, lunch, or dinner and makes an appetising appearance in savouries for afternoon tea, supper, or party refreshments. It is the home cook's standby, for it provides the easiest and most quickly prepared simple meal and is an indispensable adjunct to many elaborate meals. Moreover, it is almost universally popular, and the titillating smell of bacon, toast, and coffee carried on the morning air brings the family to the breakfast table without any calling. Good bacon deserves to be well treated; all too frequently it is fried in other fats which disguise the distinctive flavour. In this article Eva Topping, Rural Sociologist, Department of Agriculture, Auckland, describes the correct ways in which to treat it and gives a variety of recipes in which it is an ingredient.**

BACON rashers to be fried should be trimmed of rind and small pieces of gristle, then put in a hot, dry frying pan and cooked until the fat is transparent and of the desired crispness. If very crisp bacon is preferred, the fat can be poured off as it accumulates in the pan. To "crimp" the rashers they may be pushed into waves with two forks while they are cooking.

Rashers to be grilled should have the rind cut off and be laid on the bars of the grill pan, which is slid under the ready-heated grill. When the rashers are crisp on one side they are turned and grilled until the other side is done; about 2½ minutes for each side should suffice. Bacon may be "grilled" in the oven by laying the rashers singly, not overlapping, in the roasting pan and cooking them in a hot oven (about 400 degrees F.) until the fat is crisp.

For bacon curls or rolls the rind and any pieces of gristle are trimmed off and the rashers cut into pieces about 1½in. x 3in. Rolled up loosely and impaled on a skewer, they are baked or grilled until they are cooked. Bacon curls are useful for garnishing roast chicken, veal, rabbit, scrambled eggs, omelets, and similar dishes.

A large pair of scissors is easier and quicker to use than a knife for cutting off the rinds of bacon.

Bacon which is too salty may be soaked in cold water or milk before being cooked. It must be drained and dried well or the fat will splutter in the hot pan.

## Bacon for Breakfast Dishes

For many people "breakfast" means "bacon and egg;' they will scarcely consider any other dish. For those who are not disappointed if their breakfast bacon dish is varied, there are many accompaniments for the crisp rasher.

### Bacon and Eggs

Fry the bacon as described, place it on a hot dish, and keep it hot while the eggs are being cooked. Break each egg separately into a cup or saucer and slip it gently into the smoking-hot bacon fat. Spoon the fat over the yolk if a thin film of white over it is preferred. This is a better method than turning the egg, as the yolk is frequently broken during the turning.

### Bacon with Tomatoes

Cut the required number of tomatoes in halves crosswise and put the halves into a small amount of hot bacon fat, uncut side down. Cover the frying pan for 5 minutes, then remove the cover and turn the tomatoes gently; leave the cover off for the rest of the cooking time. Meanwhile fry the bacon in a second pan and serve it with the tomatoes on a hot dish. Allow three halves of tomato and two slices of bacon for each person.

The tomatoes can be baked if preferred. Put the halves uncut side down in a greased baking tin and season them with salt and a little pepper. Pour a small quantity of bacon fat over each half, or dot it with butter, and bake the tomatoes in a moderately hot oven (350 degrees) for 15 to 20 minutes, according to size.

### Bacon with Baked Beans

Tinned baked beans make an acceptable breakfast dish when served with bacon, though home-baked beans prepared the previous day are usually preferred.

If tinned beans are to be used, heat them thoroughly in a saucepan while the bacon is being cooked, adding a small pinch of herbs for additional flavour. Serve them on a hot dish with the bacon arranged on top and garnished with sprigs of parsley.

Heading photograph by Art Studios; those on opposite page by Sparrow Industrial Pictures Ltd.

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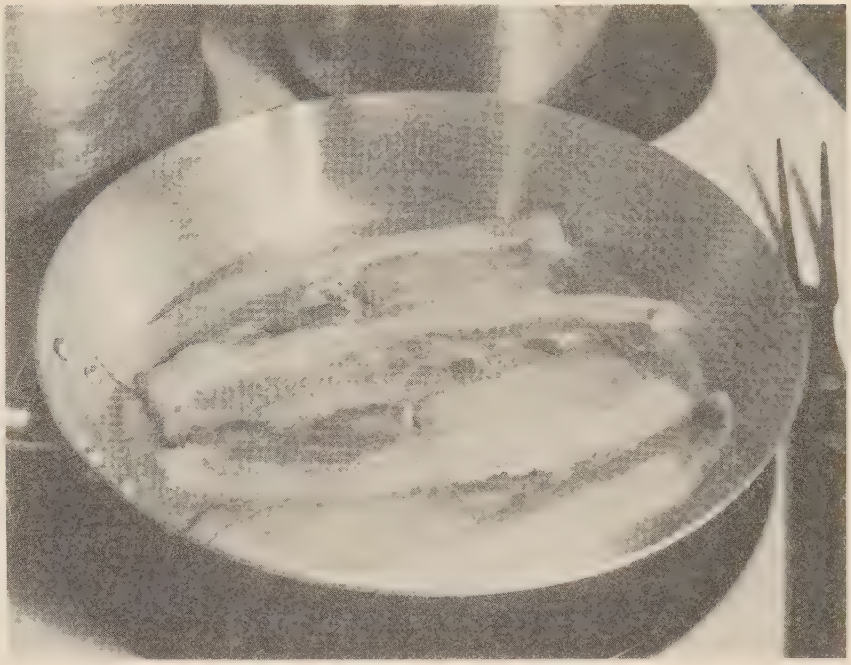


*[Sparrow Industrial Pictures Ltd. photo.*

Bacon should be fried in a hot, dry pan.

For home-prepared beans, use the following recipe and reheat the required quantity for breakfast:—

- 4 cups of dried beans
- 2 teaspoonfuls of salt
- ¼ cup of golden syrup
- ½ teaspoon of dry mustard
- ½lb. of fat bacon or pickled pork cut into cubes
- ¼ cup of tomato sauce

Wash and soak the beans for 12 hours or longer. Drain them, cover them with fresh water, and simmer them gently until they are almost tender. Cut the fat bacon or pork into pieces and add it to the beans. Mix the syrup and seasonings together, add 1 cup of boiling water, and pour the mixture over the beans. Turn them into a casserole and continue cooking them in a slow oven until they are quite soft, which will be after 6 to 8 hours.

### Bacon and Kidneys

Use sheep kidneys and allow one for each serving. Split the kidneys lengthwise, skin them, and remove the cores. Dip them in melted bacon fat or butter and grill or fry them for 4 to 5 minutes. Take care not to overcook the kidneys or they will become tough and unpalatable. Serve them with fried or grilled bacon.

### Bacon and Liver

Melt bacon fat or mild dripping in a frying pan. Skin the liver, cut it into neat slices, dip them into seasoned flour, and put them into faintly smoking fat. Fry them on one side, then turn them with a knife and cook them on the other side.

Fry the bacon in a second pan, place it on a hot dish with the liver slices, and keep the meat hot while the gravy is made. Pour 1 tablespoon of bacon fat into the pan in which the liver was cooked, add 1 tablespoon of flour, and brown it well; add sufficient boiling water to make a thick, dark brown gravy. Spoon the gravy over the slices of liver only, leaving the bacon crisp as a texture contrast.

### Bacon and Stuffed Sausages

Take the required number of pork sausages and an equal number of rashers of bacon. Skin the sausages and split them lengthwise without cutting them right through. Spread them with a piquant chutney—tree tomato, tomato, sharp apple, or plum chutney are all suitable. Close the sausages and wrap a rasher round each. Secure each end with a toothpick or run a skewer through each three or four stuffed sausages. Grill or bake them until they are cooked and serve them with fried apple rings.

### Other Accompaniments for Bacon

Fried, stewed, or grilled mushrooms, fried apple rings, left-over vegetables, and bread are other foods which make good breakfast dishes when combined with bacon. Unpeeled tart apples should be cut into thick slices, with the core removed, and fried in hot bacon fat. Stale bread cut into thick slices may be dipped in milk, drained, and fried in bacon fat until the outside is crisp and golden brown.

## Luncheon Dishes Using Bacon

Bacon is the main ingredient of many luncheon dishes and is particularly good served with some vegetables, especially broad beans, asparagus, and green peas. On a cold, wintry day a bacon roll, casserole, or pasty is an attractive hot dish.

### Bacon and Broad Beans

Cook broad beans in the usual way. Make a fairly thick white sauce, add 1 tablespoon of chopped parsley, and stir in the hot, drained beans. Have the bacon ready grilled, fried, or oven baked, and serve it in a ring round the beans on a hot dish.

### Bacon and Asparagus

Cook the asparagus carefully and make a sauce with 1oz. of butter, 1 egg yolk, ½oz. of flour, and up to ½ pint of liquid (milk and some of the water in which the asparagus was boiled). Melt the butter in a small saucepan, stir in the flour, then add some cold milk and vegetable water. Stir the mixture continually and boil it for 3 minutes. Remove the saucepan from the heat and beat in the egg yolk. Season the sauce to taste with salt and pepper. Arrange the cooked bacon and asparagus attractively on a hot dish and serve the sauce separately.

### Bacon, Buttered Eggs, and Green Peas

Put the peas on to cook in boiling salted water with a sprig of mint. Grill the bacon in rolls.

Melt 1 tablespoon of butter in a saucepan, break in 3 eggs, and add 3 tablespoons of milk, salt, and pepper. Stir gently so that the eggs cook in coarse pieces, taking care not to let them overcook. Serve the meal in a hot round dish with the buttered eggs in the centre, surrounded by a ring of green peas and garnished with bacon rolls.

Allow 1 egg for each person and proportionate amounts of the other foods.

### Bacon and Potato Salad

- 6 new potatoes
- 4 rashers of bacon
- 2 tablespoons of meat stock
- 3 tablespoons of vinegar
- 1 tablespoon of chopped spring onions
- Salt and cayenne pepper

Boil the potatoes, peel them while they are hot, cut them in thin slices, pour the vinegar over them, season them with salt and pepper, and add the onions. Cut the bacon into ½in. squares and fry it in a dry pan. Add the bacon to the potatoes and pour the heated meat stock over them, tossing the salad with two forks to combine the ingredients. Serve it with thin slices of buttered brown bread.

### Bacon Roll

- 2 cups of flour
- 1 cup of chopped suet
- 2 flat teaspoons of baking powder
- Bacon
- Sage leaves
- Onion
- Salt
- Sufficient milk, or milk and water, to make a stiff dough

Make the dough and roll it out into an oblong shape on a floured board. Arrange rashers of lean bacon on the crust and sprinkle them with powdered sage and finely chopped onion, using quantities according to taste. Roll up the crust, wrap it in a floured pudding cloth, and boil it for about 2 hours. Sprinkle the roll thickly with chopped parsley just before serving it.

This savoury dish may also be made in a pudding basin. Cut rounds of crust of varying sizes, put the smallest in the bottom of a well-greased basin, spread it with bacon, onion, sage, and seasoning, and add the other rounds,

# RECIPES FOR USING BACON

[*Sparrow Industrial Pictures Ltd. photo.*

Bacon can be an important ingredient of stuffing for veal.

alternating with bacon and other ingredients. Cover the basin with greased paper and steam the dish for 2½ hours.

### Liver and Bacon Casserole

1lb. of calf liver
½lb. of bacon
1 large cup of breadcrumbs
3 or 4 large apples
1 medium-sized onion
1 tablespoon of chopped parsley

Cut the liver into thin slices and the bacon rashers into short pieces. Place a layer of liver in a greased casserole, cover it with bacon, and sprinkle it with chopped parsley, onions, and breadcrumbs seasoned with salt and pepper. Add a thick layer of sliced sharp apples. Repeat these layers until the casserole is filled, making the last layer one of breadcrumbs. Pour over water or meat stock to fill the dish and bake the casserole in a moderately hot oven for 1½ hours with the lid on. Take off the cover, add hot water if necessary, and bake it for a further ½ hour to brown the top.

### Bacon, Potato, and Cheese Pasty

¼lb. of fatty bacon
1 cup of mashed potatoes
1 large onion
2oz. of tasty cheese
4 sage leaves
Pepper and salt
½lb. of flour
¼lb. of lard

Cut the bacon into small squares, grate the cheese, slice the onion into thin rings, and chop the sage leaves finely. Mix these ingredients with the mashed potatoes. Make the pastry with the flour and lard, roll it into a circle, put the filling in the centre, wet the edges, and press them together over the filling, fluting the closed edges with the fingers. Put the pasty on a greased baking sheet and bake it for 1 hour in a moderately hot oven.

## Stuffings and Forcemeat

Bacon adds much flavour to forcemeat balls to be served with rabbit, hare, or venison, and it is also an important ingredient of stuffings for poultry and veal.

### Forcemeat Balls

¼lb. of bacon
2oz. of finely chopped suet
2oz. of soft breadcrumbs
1 slightly beaten egg
Lemon juice
1 flat teaspoon of thyme or mixed herbs
1 dessertspoon of chopped parsley
Salt and pepper

Mix the suet with breadcrumbs and season them with parsley, herbs, salt, pepper, and a little lemon juice. Moisten the mixture with the egg, using just sufficient to bind the ingredients. Roll it into small balls and bake them until they are faintly browned and set.

### Bacon Stuffing

½ cup of chopped fried bacon
1 tablespoon of minced onion
1 tablespoon of bacon fat
2 cups of breadcrumbs
1 teaspoon of chopped parsley
¼ cup of meat stock or milk or 1 beaten egg

Mix all the ingredients together and use the stuffing for rabbit, chicken, or turkey.

### Stuffing for Pocket of Veal

2 cups of breadcrumbs
2 tablespoons of chopped parsley
Juice of ½ lemon
1 beaten egg
4 rashers of bacon
1 teaspoon of thyme leaves
Salt and pepper

Strip the leaves from sprigs of thyme, chop the parsley, beat the egg slightly, crumble the bread, and cut the bacon into small squares. Mix all these ingredients and season them with salt, pepper, and lemon juice.

Cut a deep slit in a thick veal steak, pack in the stuffing, and secure the opening with skewers or by sewing it with a coarse thread. Lay rashers of fatty bacon over the veal and roast it, basting it occasionally with bacon fat.

## Bacon Savouries for Snack Meals

The provision of savoury morsels for morning tea, supper, or other refreshments is simplified if the larder contains plenty of bacon.

### Supper Specials

Squares of bread, salad dressing, processed cheese, tomatoes or tree tomatoes, and bacon are required for these appetising tit-bits. Toast the bread lightly on one side, spread it with salad dressing, and cover it with a square of processed cheese, a slice of tomato, and a neat square of bacon in that order. Set the savouries on the grill rack, toast them until the bacon is cooked, and serve them very hot.

### Bacon Olives

½lb. of bacon
2 tablespoons of breadcrumbs
½ teaspoon of mixed herbs
2 sausages
1½ tablespoons of chopped parsley
Milk
Salt and pepper

Cut the rind from the bacon, flatten each rasher, and cut it into four pieces. Skin the sausages, mix the sausage meat with the breadcrumbs, herbs, and seasoning, and add sufficient milk to moisten them. Divide this stuffing into small portions and form each into a roll. Wrap a piece of bacon round each roll of stuffing, then run the rolls on to skewers. Grill or bake them until the stuffing is cooked and the bacon crisp. Serve them on a hot dish lined with a paper doily.

### Angels on Horseback

6 oysters
Bacon
Bread
Lemon juice
Cayenne pepper
Frying fat or butter

Cut 6 rounds of bread 2in. in diameter and about ¼in. thick. Fry them in mild dripping, bacon fat, or butter until they are golden brown. Sprinkle each oyster with lemon juice and cayenne pepper, then wrap it in a small piece of bacon. Place one on each piece of fried bread, and bake the savouries in a moderately hot oven or grill them for just long enough to cook the bacon. Serve them very hot, garnished with parsley.

Smoked fish may replace the oysters when they are out of season.

## Bacon for Dinner

Boiled bacon, hot or cold, makes a pleasant change for dinner, and it is excellent served cold with tongue or poultry. It is often useful for smaller families who might find a ham too much for their needs.

Place the piece of bacon in a saucepan with enough cold unsalted water to cover it. Bring the water to the boil and then reduce the heat to just sufficient to keep the water simmering gently. Allow 25 minutes for each 1lb. of bacon and 25 minutes more. Take the bacon out of the liquor and remove the rind. If the meat is to be served hot, sprinkle the fat with crisp breadcrumbs and serve it at once with parsley or mustard sauce; if the bacon is required for cold meals, return it to the liquor until it is cold.

Broad beans, parsley sauce, brussels sprouts, and green peas are the vegetables which seem most suited for serving with hot boiled bacon.

**Bacon is, of course, an ingredient of many other dishes but enough have been given to prove that "Bacon is Versatile."**

# RENOVATING A FAMILY LIVING ROOM

POSSIBILITIES in creating a "new look" in a large kitchen were shown in an article in the September issue of the "Journal." This article by Dorothy Johnson, Rural Sociologist, Department of Agriculture, Christchurch, tells the story of the changes made in a large family living room over a number of years, the problems being essentially similar to those faced by many country home makers—the provision of more light and more storage, better space use, and the decoration of a living room which is in constant use.

THE problems could not be met in the same way as in the kitchen. For instance, changing the wall colour to white would not have been suitable. However, a judicious use of off-white enamel on the edges of the bookcases achieved the same effect and, in conjunction with other changes, lightened a dark end of the room in a delightful way.

The renovations show other features that most families face. A clean sweep of all the family furniture was out of the question; much of it had seen service for years and bore the honourable marks of providing the sitting-room comforts of a large and growing family. Whatever new elements were decided on had to be combined with the older ones and also with the more recently acquired possessions in a way that improved as many of the realised drawbacks as possible, yet presented a harmonious whole. Cost was an important consideration.

The question was: What could be done with a moderate outlay to bring more light into one end of the room, to provide storage for the ornamental and the not-so-ornamental possessions gathered over the years, and to produce a feeling of spaciousness in the arrangement of the furniture required to accommodate the needs of everyone using the room?

## Features of the Room

The room originally was 17ft. by 13ft. with a bay window on the west side and french windows on to an open sunporch 17ft. by 7ft. facing north. The east and west walls of the sunporch are of glass. Some 20 years ago the room was enlarged by adding a 7ft. piece on the west end extending in front as far as the edge of the sunporch. The addition was therefore 7ft. by 20ft. and made the living room into an L shape. It is now 13ft. by 24ft. with a 7ft.-square alcove at the end. The glass wall between alcove and sunporch was retained and windows were built round the north and west sides of the alcove. The bay window on the west side extended right up to the door of a new bedroom added to the south-west of the house.

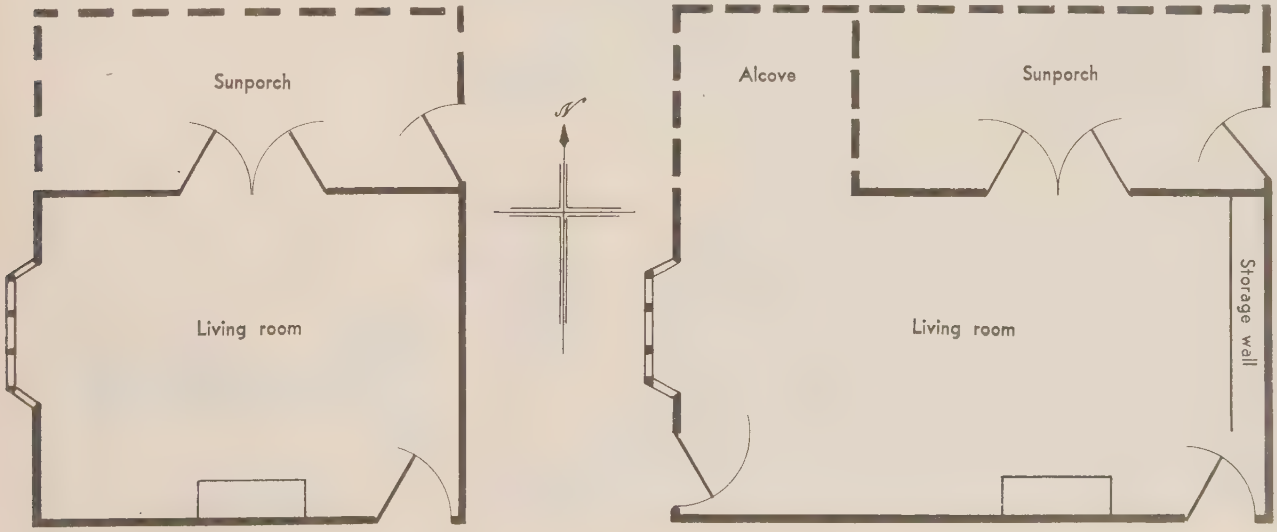
The enlarged room is very pleasing in shape. The sunny north-west alcove is a favourite resting place, containing a much-used sofa, as it is in sunshine most of the day and commands a fine sea view. The room's chief drawbacks have been a lack of natural light at the eastern end, as only shaded light through the sunporch reaches it; the difficulty of artificially lighting a large room with dark walls and ceiling which absorb the light; and the fact that the whole of the chimney of the fireplace extends into the room opposite the french windows. The last drawback is an unalterable one which makes the room narrow, creates pockets of space hard to use, and makes furniture arrangement awkward.

The left-hand photograph on page 203, taken before the alterations were made, shows the extent to which the chimney projects into the room by the width of the bridge table in front of the bookcase; it also shows the use that was made of the opposite dark corner by fitting it with a reading lamp and furnishing it for school work in the evenings. The other photograph at the top of the same page, also taken before the alterations, shows the south-west aspect of the room and the bay window; the alcove, which is not shown, is on the right. The original gas lighting was retained for years as an auxiliary when the electricity supply failed or was restricted. The photographs do not show the true proportions of the room, but make it look much wider than it is.

The walls and the beamed ceiling are of oiled wood. When alterations were proposed they were first centred on making the walls and ceiling lighter by painting them or by relining them with wall-board, but all such suggestions were finally rejected as threatening to spoil the essential and pleasing character of the room.

## Earlier Decorative Scheme

When the first photographs were taken the carpet and rugs were the keynote of the decorative scheme of the room, and they still provide the main pattern and the main colour notes. The introduction of any more pattern in the room in either the curtains or the cushions was not desirable. Red and light beige or oyster were the principal colours, but the carpets were of Indian origin and had lovely yellows and blues and a touch of orange combined in a delightful design in which the conventional crab and beetle forms were the basis. The curtains were unpatterned, some red and some oyster in colour, and mostly just of hessian, which was the only material available in the desired colours at the time. However, they are very suitable, especially those that hang from ceiling to floor to enclose the fireplace end of the room in the winter. The



Plans of the old and new living rooms.

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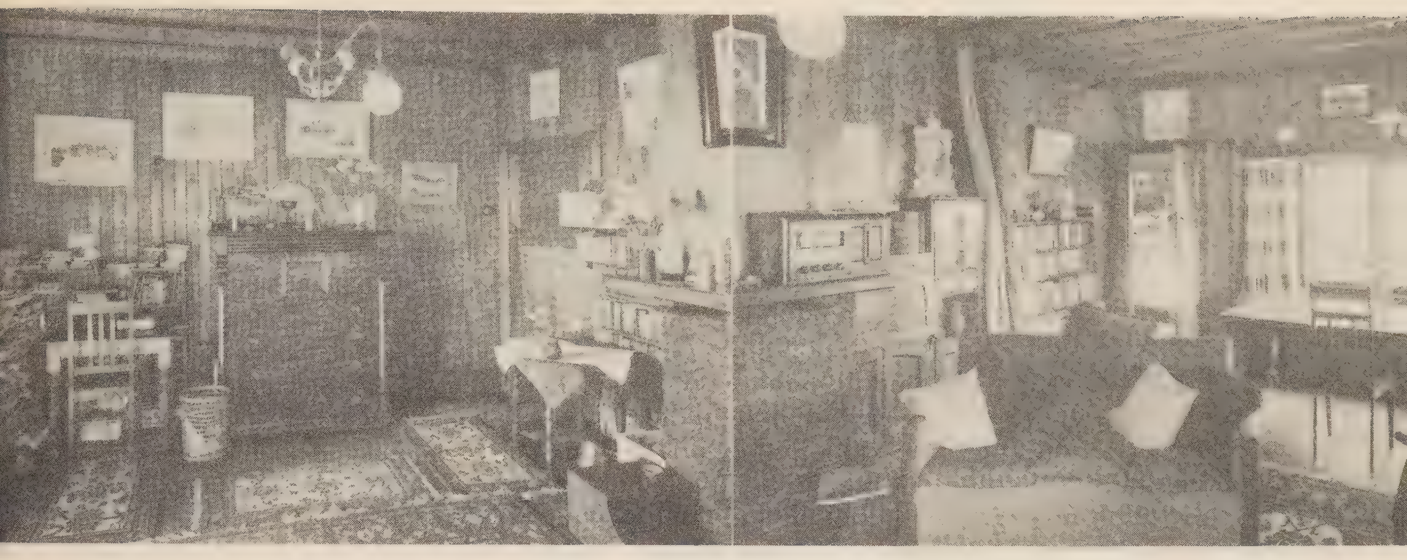


Two views of the room before the renovations were begun. [*Green and Hahn Ltd. photos.*

chairs and sofas had been re-covered in differing combinations of the same two colours of hessian, with red corduroy velvet cushions. These chairs had become faded, worn, and shabby, they were no longer comfortable, and their replacement was hoped for. Books, periodicals, and papers filled available bookshelf space to overflowing.

The carpets and curtains to match were more recently acquired possessions. During the earlier years of the family the floor was of polished wood with rugs and the room was regularly used for folk dancing and games. It was claimed that the chairs and tables could be pushed through the french windows on to the sunporch and a space cleared, with the piano and gramophone in the alcove, in less time than the girls required to change their shoes. Later table tennis was played, and often 12 or more people sat down to meals when there were visitors. A large extending table met both needs and, though old fashioned, is still a feature of the room.

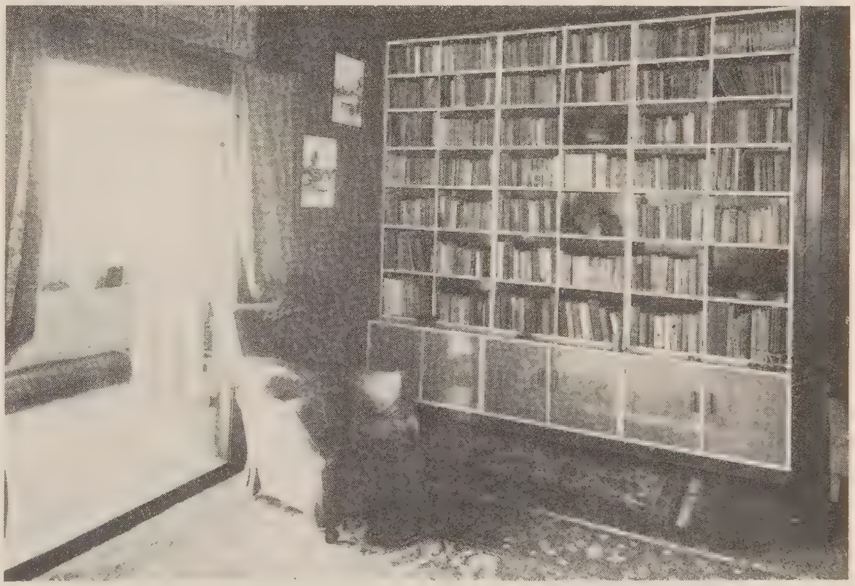
These points are noted because they show the kind of stubborn facts that most home makers have to deal with in their redecoration schemes. From a number of points of view, especially those of space and appearance, the removal of that table is now called for, but how are the services it still gives to be performed? What is the cost of replacement? On a limited budget what changes are most desired? It became clear that all renovations must be done with the pattern and colour scheme of the carpet as the main focus. Fortunately the curtains and chairs already fitted in with that scheme and, if necessary for economic reasons, could be retained as they were for a time.

## The Storage Wall

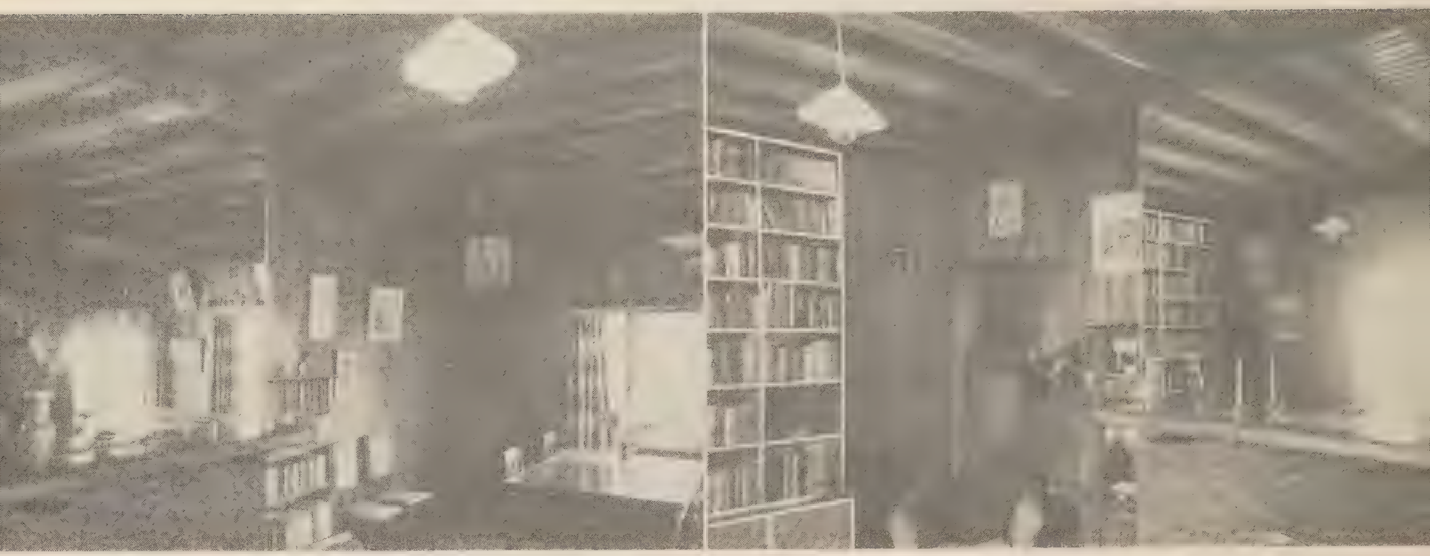
Finally a decision was reached to put a storage wall in the dark east end of the room. It happened that books, pamphlets, and business papers of the outside organisations in which members of the family were interested presented the chief display and storage problem in this house. However, in other houses storage walls can be devoted to a number of different purposes and will bring a modern note to a room. In new houses they are built in and are permanently a part of the structure of the house.

**Could such a wall be built on the "unit furniture" principle so that its sections could be rearranged in this house or elsewhere to suit circumstances and requirements? In other words, could it form part of the movable furniture rather than part of the structure of the house? Such flexibility in use would warrant some increase in the initial cost. A positive answer to this question influenced the decision to proceed.**

Between making the plans and photographing the finished structure nearly 2 years elapsed because of shortages of labour and materials. Accomplishment was despaired of several times, but the photograph below shows the storage wall erected and in use on the windowless eastern wall of the room. (It was taken from a slightly different position from the left-hand photograph above and includes the french window.) The architect designed it in six separate units—three open shelf units and three double cupboards. The bookcases contain 42 compartments, 18in. wide and of varying depths, and rest on the cupboards, which are mounted on domes. The cupboards project 6in. beyond the shelves and to avoid toe marks are recessed a few inches at floor level.



The storage wall. [*Green and Hahn Ltd. photo.*



Two aspects of the mirror wall. [*Green and Hahn Ltd. photos.*

The wood is rimu, but the cupboard doors are finished with totara veneer.

The flexibility gained is considerable. As at present used the six pieces form almost a complete wall, yet they can be used in a variety of ways. Any of them can be moved to other positions in this room or in others. A new arrangement in the same room could be one bookcase and cupboard on each side of the fireplace, or one on the left and two on the right. In a house with a lower stud the shelves could be used singly or in groups from the floor. The cupboards would make excellent bedside cupboards. One could be placed on top of another to form a china cabinet or sideboard in a narrow space, or placed on top of the other two side by side where more space was available.

In choosing the colour scheme of the storage wall the family's imagination failed, and the situation was brazened out by giving preference to the wood in its natural state. However, the architect came to the rescue with results that even the camera has recorded. The inside surfaces of the shelves were painted deep ferric red, which harmonises perfectly with the reds of the carpet. The edges of the shelves and cupboards were enamelled off-white and the cupboards were finished in clear honey-coloured varnish. The recessed piece below the cupboards is ferric red. The painting took a week to do, but gone is the dark corner. The white enamel picks up the light, the varied coloured bindings of the books repeat the colours in the carpet, also against a background of red, and some treasured pottery has never before been seen to such advantage. Chinese embroidery pictures on white satin on one side and on red satin on the other add to the general effect and could not be displayed better.

However, a long period of trial and error was needed to sort out and rearrange the pictures and the furniture to live with the new additions. The most frequent answer to appeals for an opinion on this and that was "Get rid of it"—such a simple solution to the decorative difficulties of older possessions. Probably it will be done in the end, though only by degrees.

## The Mirror Wall

During the discussions involved a solution to another of the difficulties mentioned earlier was arrived at, and in a short time another modern amenity was added to the room, disposing of the difficulty of the chimney and adding several other advantages —a mirror wall on the chimney.

With the chairs still uncomfortable and shabby, buying a mirror 5ft. square and placing it on the projecting chimney wall did seem quixotic, but it has paid dividends of pleasure and, incidentally, stimulated ingenuity in replacing the chairs with still less money left to spend. The photographs above show the mirror in position, but not all its delights. First and foremost, it made the projecting chimney seemingly disappear and in its place is an accurate reflection of features of the room itself and of the view beyond—the sea and the long breakers of the Pacific Ocean. The photographs do show the clear-cut reflections of the bookcase, and one also shows a reflection of the alcove on the right of the room and the piano against the opposite wall. A further vista of the east coast of Canterbury can be seen through those reflected alcove windows. Had it been photographed on Christmas Day, the mirror would also have shown a small card in one corner reading "From Everybody to Everybody with Greetings."

The big table is shown with its leaves removed. Gone, alas, are the days of table tennis, but not entirely those of meals with 12 people round the table. The wall mirror has increased the sense of space and light to a marked degree, even more at night than in the daytime. This last result was not foreseen. The photographs show up attempts to decide the most suitable artificial lighting; the shadowless fluorescent light is hoped for. Already the combined effect of storage wall and mirror has greatly increased the effectiveness of the present lights at night. The problem is now reduced to an economic one.

## Seating Accommodation

High-backed chairs were preferred to a suite. The old sofa remains in the alcove. The changes described put new modern chairs out of financial range for the time being, but the discomfort of the old ones acted as a spur and a search was made for second-hand ones of the desired shape and construction. These found, the springs were reconditioned and loose covers decided on. Again came delay and frustration; materials to fit the needs could not be found. Figured materials were out of the question, and plain ones were not the right colours or were such light shades that they were impracticable for a room in such constant use.

The solution finally came from the use of a striped coloured cotton material which had bands of yellow, orange, red, green, blue, and black of varying widths, but never much more than an inch. It was also Indian in origin, so the dyes blended perfectly with those in the carpet. Only enough was procurable to do three chairs. The stripes were cleverly arranged by the upholsterer and harmonised with the coloured stripe effect of the books. There were just enough pieces to make extra arm covers. Another chair was done in plain red hessian and a fifth had been upholstered in green corduroy a year before. The existing red corduroy cushions fortunately could be retained as good accessories.

**The room is not finished—perhaps it never will be—but it has a "new look." It has changed with the changing years. Its story is typical of those of many country living rooms, so important as the centre of the recreational side of family life. Perhaps other home makers can take from it some hints or ideas to suit their own situations.**

# DYEING

A CHANGE of colour scheme in the home would often be pleasant were it not so expensive to buy either new fabrics or new garments, especially when those in use are still in good condition and seem to have years of wear left in them. With a little expenditure and some time and care, the housewife can give her home a complete "new look." Home dyeing of fabrics is neither expensive nor difficult if a few basic rules are followed, and it can be an interesting hobby for those who wish to go on with it. The technique is described in this article by Nell Macpherson, Rural Sociologist, Department of Agriculture, Auckland.

[*Sparrow Industrial Pictures Ltd. photo.*

SOME good-quality all-purpose dyes and tinting products are on the New Zealand market. They are inexpensive and simple to use and usually have excellent instructions with them.

Before any dyeing operations are begun certain factors must be considered—the type of fabric to be dyed, the type of dye most suitable, the time and equipment required for the work, and the need for removing the old colour first.

**For the first attempt at home dyeing, something simple should be tried.**

## Types of Fabric

Fabrics may be made of natural or synthetic fibres, and as these fibres take up dyes in different ways it is important to know of what fabric the material is made. Natural fibres may be subdivided into animal and vegetable fibres.

### Animal Fibres

**Cultivated silk** is a fine, smooth, pliable, glossy fibre which when burnt gives a smell of ammonia and leaves a bead of ash which is easily crushed in the fingers. It takes up dyes very readily. Crepe de chine is an example.

**Wild silk** is a coarse, rough fibre without lustre. It burns in the same way as cultivated silk. It does not take up dyes very readily. Fuji and shantung silks are examples.

**Wool** is a short, kinky, springy fibre, furry in outline and nearly always non-lustrous. When burning it appears to smoulder and gives a smell of ammonia and a black bead of ash which is easily crushed in the fingers. It takes up dyes very readily.

### Vegetable Fibres

**Cotton** is a very short, straight fibre, non-lustrous unless it has been mercerised. When burning it flares up quickly and leaves practically no ash. Cotton does not take up dyes easily, but colours may be made "fast" by long boiling. Prints and haircords are cotton fabrics.

[*Sparrow Industrial Pictures Ltd. photo.*

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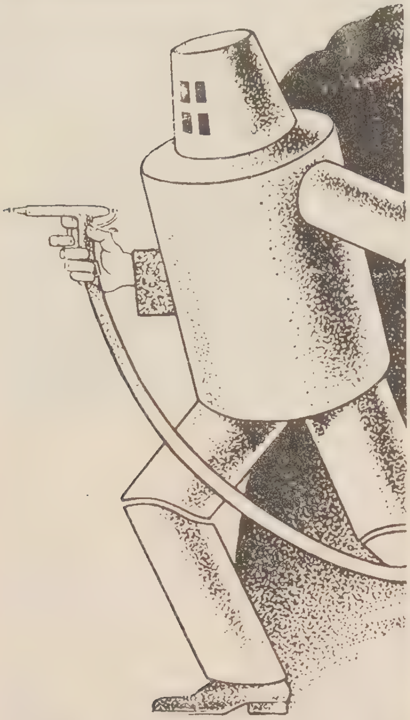

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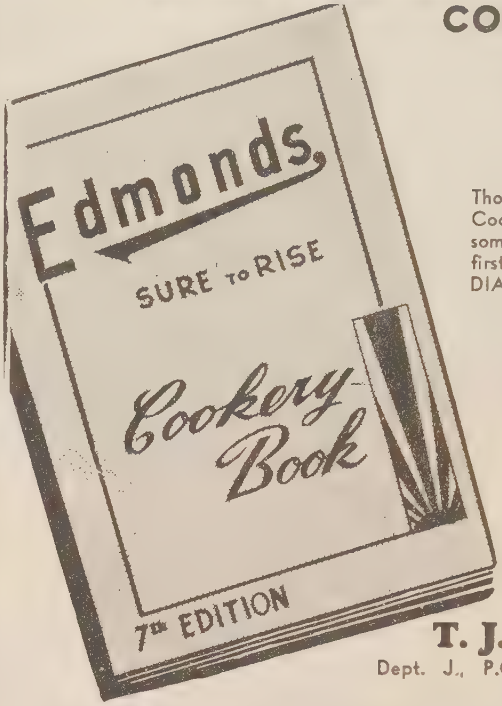

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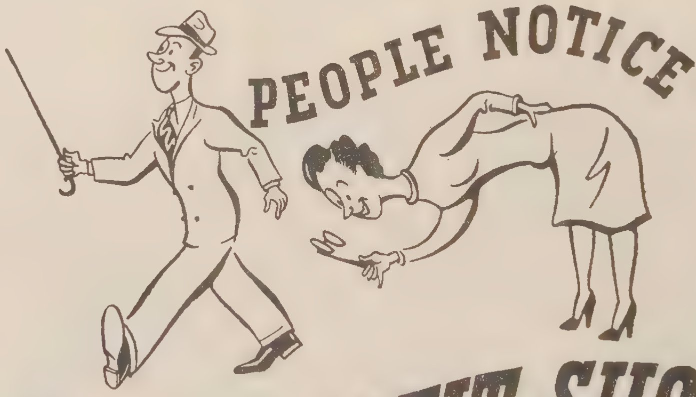

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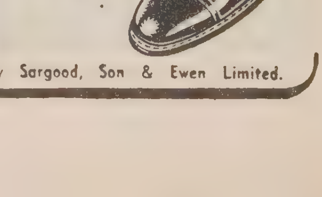

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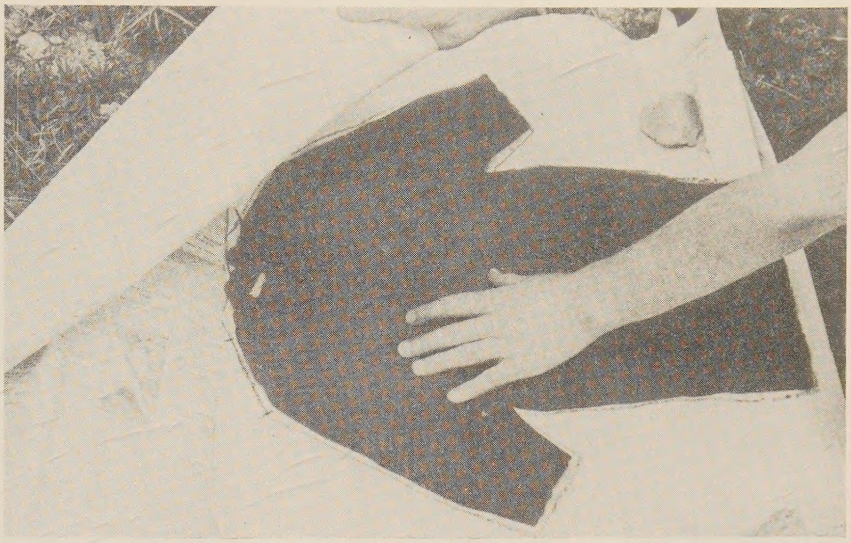


[*Sparrow Industrial Pictures Ltd. photo.*

Patting a knitted garment into an outline of the original shape.

**Linen** is a long, straight, very lustrous fibre. It burns similarly to cotton. It does not dye readily and to obtain a good colour it must be held in the dye for a considerable time.

**Synthetic Fibres**

**Viscose rayon** is a long, smooth, lustrous fibre, rather heavier and stiffer than silk. It burns in the same way as cotton and takes up dyes quite readily. Most lingerie "silks," artificial linen, and spun fabrics are made of viscose rayon.

**Acetate rayon** is also known as cellulose acetate rayon. It is similar in appearance to viscose rayon, but it burns with a quick flare in the flame to leave a hard, uncrushable bead of ash. It is extremely difficult to dye and this work is better not attempted at home. Knit lingerie and some lingerie fabrics are examples.

**Nylon** is a long, smooth, exceptionally strong, elastic fibre. It appears to melt rather than to burn and leaves a hard grey bead of ash. Nylon takes up some dyes very successfully.

## Types of Dye

A large number of dyes on the market at present are suitable for home use. The colour range is extensive and the nature of the dyes varies greatly. They may be grouped as follows:—

**All-purpose dyes** may be used at a temperature to suit the material being dyed. Cold-water dyes are suitable for tinting or reviving colours or for use on silk, which takes up dye readily. Hot-water dyes are suitable for fabrics which should not be exposed to boiling temperatures. Boiling-water dyes are used if the dye is required to be "fast" to all usual laundering processes and especially if dark shades are required.

**Dyes soluble in hot water only** are used for fabrics which would be injured by high temperatures.

**Dyes which act on animal fibres only** are used for silk and wool and may also be used to dye union fabrics—that is, fabrics made of a mixture of fibres—if a two-colour mixture is desired. Care is essential when dyeing union fabrics.

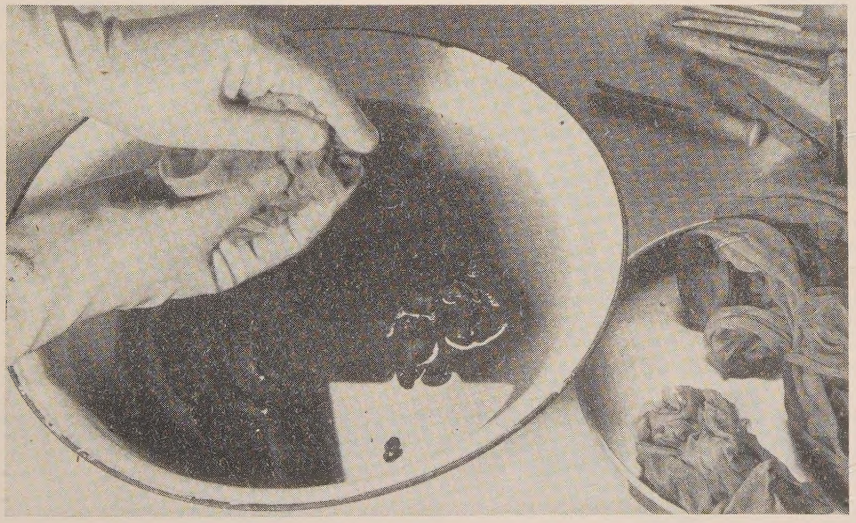
**Dyes for rayon** may be used for viscose rayons but not for cellulose acetate rayons.

In general, the best for household use are the all-purpose dyes. When dyeing union fabrics, such as some novelty tweeds, two shades of one colour may be obtained by using all-purpose dyes.

**Any fabrics in good wearing condition, though possibly faded, are suitable for dyeing. Preferably a fine day and one on which comparatively little else needs to be done should be chosen.**

## Equipment

Old utensils or those which can be cleaned thoroughly should be used for dyeing. Enamelled or galvanised tubs or buckets and coppers for boiling dyes may all be cleaned so that no trace of dye remains in them. A stick is needed for stirring the articles in the dye bath and, as the wood will absorb the dye, it must not be used for other laundering purposes, as the dye might come out of the wood and mark articles. A rubber apron and gloves prevent dye staining the hands or clothes.



[*Sparrow Industrial Pictures Ltd. photo.*

Stockings can be tinted darker or dyed a different colour.

## Articles which can be Dyed at Home

Straight fabrics such as curtains and tablecloths may be dyed easily in the home, as may nearly all unlined garments, but dyeing shark-skin garments or lined suits and coats should be left to commercial firms. Hems on articles to be dyed should be let down.

Shrinkage may take place in dyeing if care is not exercised, particularly with woollen goods if they are roughly treated. Therefore woollen goods should be measured before they are dyed and gently patted back to the right shape and size before being dried.

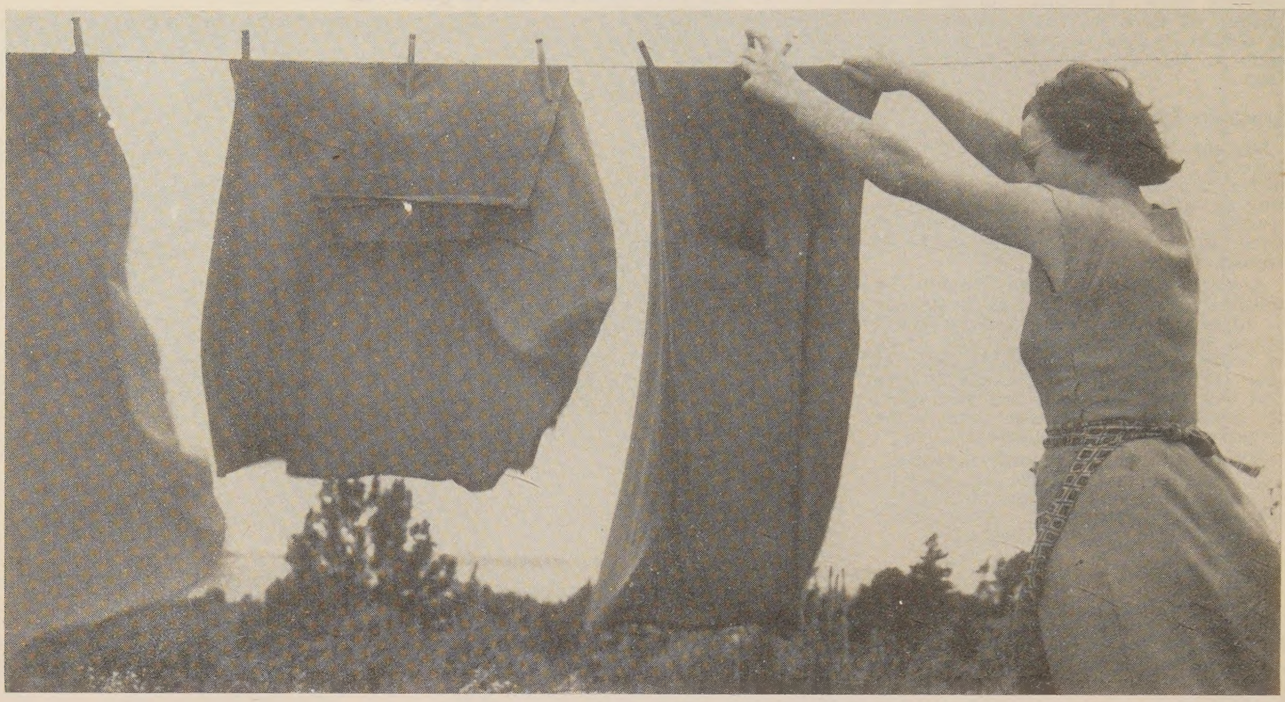
A print may be dyed successfully and will retain its pattern, as the colours already present will combine with the new colour to give the old pattern in new shades.

Stockings may be tinted darker or dyed a different colour at home.

## Removing the Old Colour

The need for first removing the old colour presents a problem to many people who wish to dye faded fabrics. If the fabric is streaked or spotted or unevenly faded, it is wise to undye it first. This may be done with most fabrics by using one of the commercial undyeing products, but the directions should be followed accurately.

# DYEING GARMENTS AND FABRICS



[*Sparrow Industrial Pictures Ltd. photo.*

**Results are usually better if dyed fabrics are dripping wet when hung out.**

It is also wise to strip or undye colours which will react with the dyeing shade to give an undesired colour. For example, yellow fabric treated with blue dye probably will turn a greeny blue or green, and pink fabric dyed with blue will become violet.

## Reactions and Precautions

**Cottons and linens** are very safe and easy to dye provided the rules and suggestions given are followed, and it is with these that the housewife probably will make a start. Large, old-fashioned, white linen or damask cloths and bed covers are easily dyed in attractive new colours. Curtains also are easily tinted. If a novelty striped effect is desired, the material to be dyed can be bound tightly at intervals to give an indefinite-edged stripe. Knotting of materials also can give some very interesting effects, but much practice is needed to do this successfully.

**Woollens:** Keep the dye bath at simmering temperature and stir woollens gently while dyeing them, as rough treatment will shrink and felt the materials. When the article is the desired colour, take it out of the dye bath and give it the first rinsing at the same temperature as that of the bath. Rinse it 5 or 6 more times, gradually lowering the temperature to tepid. Pat it into shape and dry it, preferably flat between newspaper if it is small enough. Iron the garment while it is still slightly damp, using a pressing cloth both underneath and over it, because some of the colour may come out.

**Silk** may be tinted very easily and usually boiling it is unnecessary.

**Viscose rayon** should be treated as for cottons.

**Nylon** can be treated easily with the new all-purpose dyes. Because it is usually sheer, nylon will always look lighter when it is dry. Nylon is much better not boiled when being dyed.

**Cellulose acetate rayon:** It is wiser not to dye this fabric because in most cases the result is unpredictable.

**Stockings:** Darker shades are fashionable at present, and most people have found that stockings bought during the past year are not dark enough. They may be dyed successfully by using any good stocking dye and following the directions carefully. Boiling them usually is not necessary if a sufficiently dark dye in the required toning is used. Wool, silk, lisle, rayon, and nylon stockings may all be dyed successfully.

**Whatever the type of dye or fabric, precautions which should be observed are: Use a good-quality dye; protect the hands and clothes; remove the article from the dye bath before adding more dye; and rinse a newly-dyed article until the last rinsing water is clear.**

◆

### GENERAL RULES FOR DYEING

Follow the instructions given with the dye accurately and carefully.

See that all articles to be dyed are really clean.

Dispose of the dye wrapping as soon as possible.

Remove buttons, snap fasteners, slide fasteners, and all metal and other ornaments from the fabric or garments. Undo hems and pull out pockets.

Know the fibre content of the material to be dyed.

Measure the garments or draw an outline of them before dyeing them and pat them back into shape before drying them.

Choose the dye according to the type of material to be dyed. For a lighter or darker shade use less or more dye in the mixture.

Calculate correctly the amount of dye required, which usually is based on the dry weight of the goods.

Have plenty of water to cover the goods and to allow for free movement of them in the dye bath, as streaky dyeing results when the goods are not fully exposed to the dye.

Test the dye on a piece of fabric before immersing the whole article.

Use plenty of rinsing water to wash out all surplus dye.

Do not wring dyed material tightly, but squeeze out the dye and rinsing water gently. The result usually is better if the fabric is dripping wet when it is hung out.

Remember that fabrics look darker when wet than when dry.

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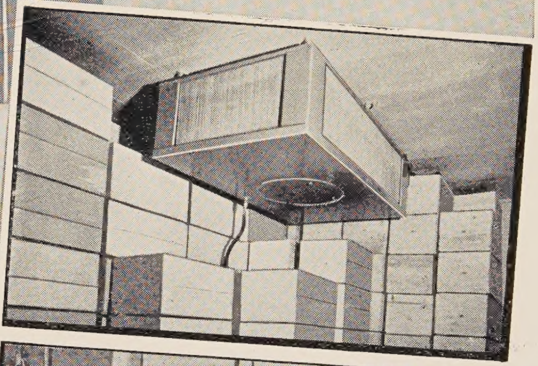

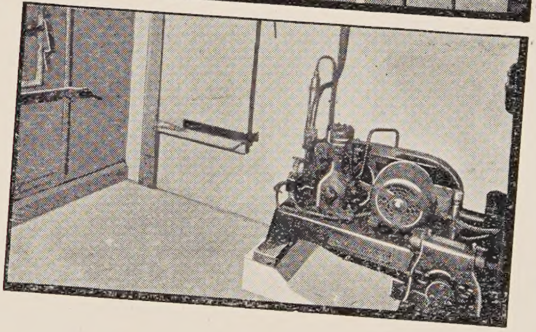

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